THE McGRAW-HILL DIGEST

ENGINEERING · INDUSTRY · SCIENCE · BUSINESS

OCTOBER 1946

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Excerpts from current numbers of
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Authorities In a Particular Industry Can Frequently Profit Through Knowing About New Developments In Other Fields

One of the great advances in food preservation was made possible through adaptation to quick freezing of a flotation process used in the mining industry, and this is only one example of how a development in one industry can be profitably utilized in others—only one example of the importance of keeping abreast of developments in all branches of industry.

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What Atomic Power Means

Economics of electrical generating and distributing systems relegate it to something less than revolutionary importance to industry

In those industries in which the cost of power represents only a few percent of the total cost of production, no new process of energy production could affect economic expansion significantly.

At the power houses, there is no hint that atomic energy will change the so-called electrical galleries or the switchyards, or do away with generators and turbines. The economies that may take place back of the turbogenerator may be of great significance in the boiler room, but they will not radically modify the overall industrial structure.

Any economic advantages ultimately occurring from atomic energy in power generation will come into utility systems distributing energy rather than into lesser, isolated plants.

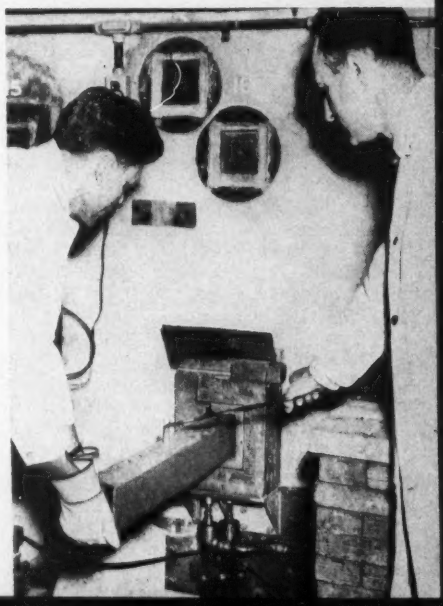
The fuel cost for coal at $4 a ton is about the same as for fissionable material at $6,000 a lb. It would seem that this latter figure should be reached or bettered in the course of lengthy research.

Certain fission products accumulate when the pile is producing power, and it will be necessary to remove the active material periodically and extract the "poisons." It is thought that the pile can be designed so that this need be done only at long intervals, making practical operation possible. —ELECTRICAL WORLD

U-235 will not be used commercially for large-scale steam generation in stationary plants until it can compete with local coal, oil, or natural gas on a cost basis, and the cost of natural uranium is a negligible factor in the cost of atomic fuel; the cost resides mainly in the process of purifying the natural product. Possible explosion danger and need to protect personnel against radiation are other important considerations. Those who look for an economic revolution from coal-free atomic power are wrong. Coal is but a fraction of the delivered cost of power.

Power-plant economics is by no means the most pressing problem in the field of nuclear energy. No. 1 problem is that of atomic bombs and rockets. Our first job is to contrive international agreements that can prevent the mutual destruction of nations by atomic weapons. Atomic research is a No. 2 responsibility, for nucleonics promise developments as strange and wonderful as those from the work of Faraday. —POWER

ATOM DOES CONSTRUCTIVE WORK—Production of radioactive isotopes that are to be used in research in the medical and other fields. Containers of the materials are inserted into holes in a graphite block, which is pushed into the center of the chain-reacting uranium pile for neutron bombardment. —PRODUCT ENGRG.



The Way to Prosperity

U. S. industrial history shows that increased use of power through factory mechanization means better living for all

Far from reducing employment, mechanization in U. S. factories has increased both the number of jobs and the rate of pay, and by 1950 there may be more jobs than workers. In that year it is estimated that 9,581,000 factory workers will be available (based on present ratio of 6.7% of total population), but if the standard of living is to go on up at the 1879-to-1939 rate, 11,140,000 workers will be needed. And by 1970 the worker deficit may reach 3,248,000.

It is clear that by becoming more efficient we are not going to work ourselves out of jobs. We can go ahead safely to increased output per man-hour. In fact, that appears to be our only salvation, if we are to have the desired higher standard of living for everyone.

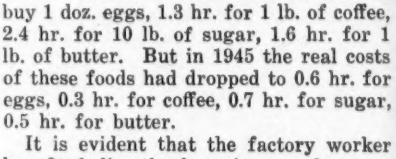
It is certain that the required increases in output per man-hour are not going to come out of greater physical exertion of workers. The great increases in output per man-hour will result from technological improvements, as they have in the past. That means more productive machines, better methods, increased use of power.

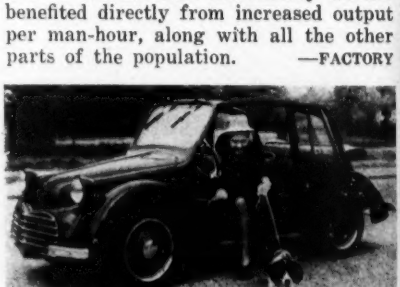
At present the power used in making things in factories is about 7.25 hp. per worker, compared to 4.91 in 1929, 1.25 in 1879. What further increase in power utilization will do can be judged from the effect in the past.

Output per man-hour of work increased 2.6 times in the 30 yr. from 1909 to 1939, paralleling an increase of 2.3 times in hp. per worker and an increase from $1,082 to $6,134 in money invested in plant equipment per worker. In 1879 the average value of products produced per worker was $1,965 per year; in 1939, $7,208 per year. Value added by manufacture was only $722 per worker per year in 1879, but was $3,130 in 1939. And in 1879, hours per week per worker averaged 57.1; in 1939, 37.7.

Important too, the purchasing power of wages doubled from 1909 to 1939. Expressing wage rises in practical terms: in 1913 it took 1.5 hr. of work to buy 1 doz. eggs, 1.3 hr. for 1 lb. of coffee, 2.4 hr. for 10 lb. of sugar, 1.6 hr. for 1 lb. of butter. But in 1945 the real costs of these foods had dropped to 0.6 hr. for eggs, 0.3 hr. for coffee, 0.7 hr. for sugar, 0.5 hr. for butter.

It is evident that the factory worker benefited directly from increased output per man-hour, along with all the other parts of the population. —FACTORY





FRENCH RADICAL—The chassis weighs only 100 lb., wheel spokes are integral with hubs, an air-cooled horizontally opposed engine drives the front wheels, and torsion springing is used in the new 800-lb. French Gregoire automobile. —BUSINESS WEEK

CHANGES INCREASE KNITTING PRODUCTION

By reducing 150 active styles with 25 color variations to 20 styles with 8 basic colors, Spalding Knitting Mills eliminated complicated pattern designs and has color combinations applicable to several styles. A shift to piece-rate pay on all ribbing machines at this mill increased output more than 30%. Air conditioning, fluorescent lighting, and rolling canteen wagons improved the comfort and efficiency of employees.

Production planning classifies orders as ingrain or dip-dye styles. The 8 basic colors produce strong color combinations on ingrain patterns and have greatly reduced the number of dye operations necessary for color shading. By maintaining the same series of colors on the pattern yarns and changing the basic colors, different styles can be obtained with only one reset of a knitting machine. —TEXTILE WORLD

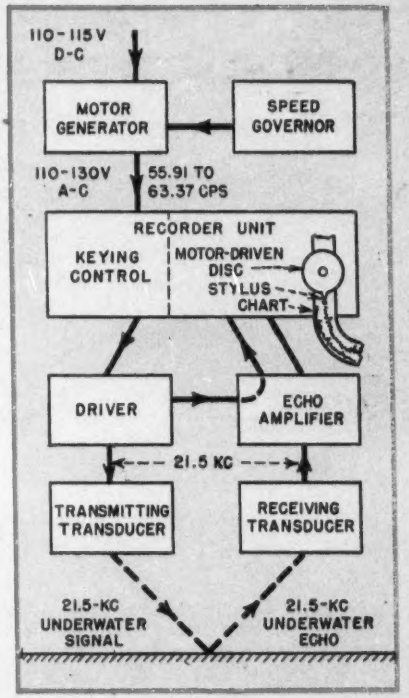
AERIAL MOTORCYCLE

Powered by a 35-hp. engine, the 1-man helicopter being built for test by Hoppicopter, Inc., will fly 90 mph., cruise 200 miles on 4 gal. of gasoline, and climb to 12,000 ft. It will have a 15-ft. rotor and be operated by a single coordinated stick control. An earlier model was designed to strap on the back, but this one will have a seat and light tripod landing gear. Expected uses are in messenger service and patrol work. —AVIATION NEWS

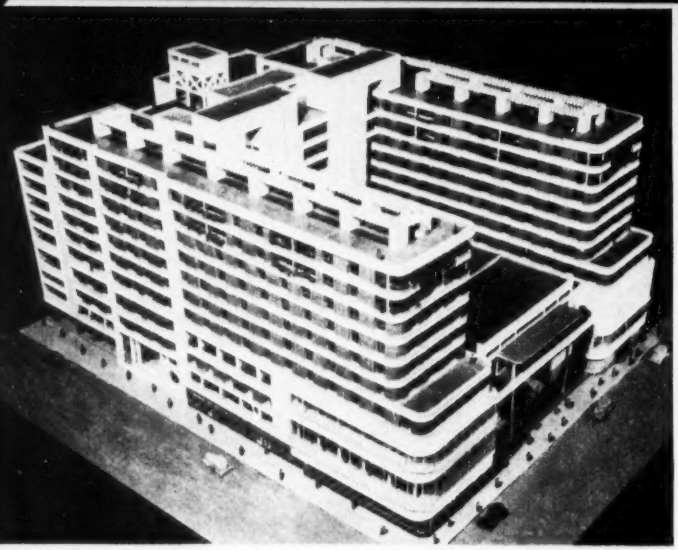
GERMAN METAL METHODS

Vacuum melting and pouring of alloys for thermocouples, heating units, and precision springs were utilized in a German factory, Heraeus Vacummschmelze, to prevent loss of beryllium, improve alloy composition, and attain better hardenability. Most of the alloys were poured inside induction electric furnaces with 7 mm. Hg. vacuum. Casting was done in a water-cooled copper mold.

The Germans reduced alumina at high temperatures in a centrifugal furnace, coal dust carbon serving as the reducing agent. Centrifugal force held the molten bath against the sides of the furnace, protecting the refractories from the intense heat of the oxygen-fed powdered-coal flame; ends of furnace were water-cooled. —BUSINESS WEEK



DEPTH AND FISH FINDER—An accurate continuous profile of shallow-sea or river bottom is plotted on a strip chart by improved electronic echo sounding equipment, obsoleting older methods employing weights or drag lines. Its overall range is 75 ft., and this may be positioned anywhere between 3 and 250 ft. Accuracy is ±3 in. up to 50 ft., 1% at maximum range. Shown functionally, the instrument includes a motor-generator power source, a driver with a capacitor-discharge system for shock-exciting the magnetostriction transmitting transducer at 21.5 kc., magnetostriction transmitting and receiving transducers, an echo amplifier, and a recorder in which is incorporated a keying control for the driver. This sounder will determine the location and size of schools of fish. —ELECTRONICS



MEXICO HOSTELRY—To relieve the shortage of first-class accommodations, Mexico City is now finishing work on this $4 million hotel. Providing 600 air-conditioned rooms, garage for 300 autos, and 6 "Presidential Suites," the hotel will assist the tourist business. —ENGRG. NEWS-RECORD

SEX DETERMINATION FOR SILKWORMS

To make silkworms produce female offspring, a Russian scientist gives unfertilized eggs a heat treatment. For male offspring (which give considerably more silk), he subjects the female worm to x-ray treatment before fertilization. Only the cytoplasm of the egg then remains active, and thus only males develop. —TEXTILE WORLD

DEAF MUTES GOOD WORKERS

Akron tire manufacturers have been hiring deaf-mute workers for more than 30 yr. as a matter of daily routine. It follows that ex-soldiers with impaired hearing will make satisfactory workers. But no deaf person should be assigned to a noisy job simply because he is deaf, because many are hypersensitive to the irritation of noises they perceive. The segregation of deaf workers under specially qualified supervisors has been tried with only indifferent success. Their aptitudes are too varied to be channeled in one direction. The safe rule is to make assignments under congenial foremen on a basis of qualifications for the job. While the breaking-in period required more than a normal amount of patience and written instruction (don't depend on lip reading), there will be a dividend in the loyalty and dependability of the worker. —FACTORY

ELECTROKYMOGRAPH

Because it enables a physician to photograph accurately the motion of the heart, a new electronic device permits early diagnosis of heart trouble. Developed by Temple University and the U. S. Public Health Service, the electrokymograph is more useful than x-rays in studying heart action, because the motions revealed by the latter are more complex than the eye can fully comprehend. —BUSINESS WEEK

CHEAPER NITRIC ACID

A proposed plant for the oxidation of ammonia, using oxygen instead of air, would recycle the tail gas and mix it with fresh incoming oxygen. A rich mixture of ammonia, with low preheat, would operate without danger of explosion and would give high yield. Power savings would be 50-65%. The increased rate of reaction raises the equilibrium acid strength and reduces the absorption equipment needed. —CHEMICAL ENGRG.

CONTINUOUS PROCESS FOR SUPEREXPLOSIVE

Averaging 700 tons daily of a powerful explosive (second only to atomic bombs) a plant in Tennessee used assembly line production. Raw materials for RDX were piped in semi-fluid form, thus eliminating much haulage and handling. In a "pellet process," powdered RDX was mixed with melted TNT and the mixture dripped in tiny globules onto a moving belt. Cooled as they traveled, the solid pellets were then ready for shipping. Cost per pound went steadily down from 30⅛ to 10¼¢. —ENGRG. NEWS-RECORD

NO-ICE, NO-FOG GLASS

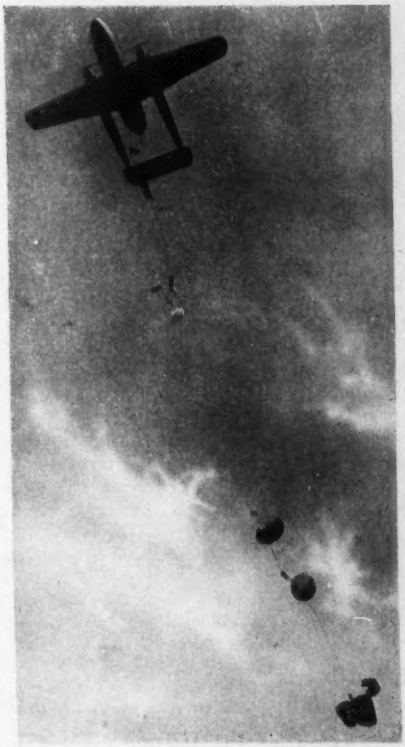
Formation of ice on outside and fog on inside of windshields is prevented by passing warming electric current through a thin, permanent, transparent coating. Originally developed by Pittsburgh Plate Glass to drain static from the glass covers and dials of electronic instruments, the coating conducts current uniformly across glass.—BUSINESS WEEK

HANDLING MAGNESIUM SAFELY

As a dust, such as produced in the grinding of castings, or in ribbon form, magnesium can be ignited very easily. Wet magnesium chips burn more intensely than dry chips. There is always considerable danger of an explosion with burning magnesium, and ordinary extinguishing agents are not effective. Water and carbon tetrachloride accelerate the burning; carbon dioxide has no pronounced effect; argon and helium are impractical; hydrocarbon gases have limited use; nitrogen and sulphur dioxide are ineffective and may be dangerous.

Magnesium dust can be removed from the air by oil or water spray, the resulting sludge being buried or burned. Periodically tested steel pots, with large dry safety pits below them, are used for casting. In machining operations, sharp tools, moderate cuts, and coolants such as mineral seal oil or lard oil which do not contain water, are important.

Chips must not be allowed to accumulate. Castings should be stored in separate small piles, with no (possibly damp) basement underneath the storeroom. A sprinkler system will speed the burning of magnesium and apparently make the fire more severe, but the water discharge keeps the room relatively cool, protects the building and prevents ignition of surroundings except within a few feet. —FACTORY



IN-FLIGHT UNLOADER—In 6 sec., 18 containers of 350-lb. capacity are released by a new Fairchild automatic monorail from the C-82 "Packet." Strung together, the packages are discharged by pressing a button which actuates the dropping mechanism and the machinery which returns the monorail to position. —AVIATION NEWS

New Uses for Carbides

Machine designers are taking advantage of cemented hard carbides to solve wear, abrasion, galling, gripping, and deflection problems

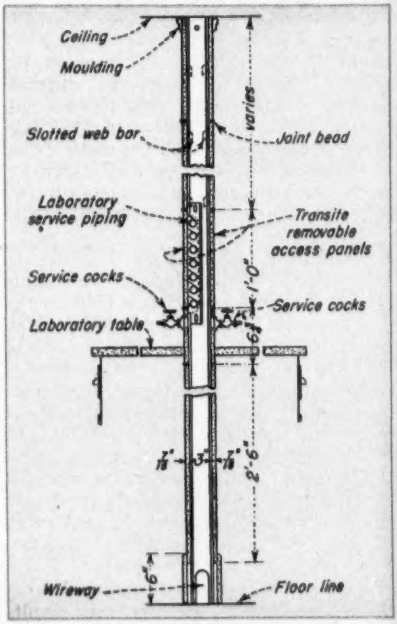
Heretofore used principally for their superior metal-cutting ability, the cemented hard carbides now are finding increasing application where wear, abrasion, deflection, and galling resistance are required. Examples are: grinder workrests, gage elements, bearings, bushings, slides, vises, solid boring bars, small wheel spindles, pins for knurling rolls, clamping devices, and strip mill rolls.

The Young's modulus of elasticity for the material is 2.4 to 3 times that of steel, and varying the composition gives the designer considerable latitude in stiffness. Thin strips are even springy. The hardness of cemented carbide ranges from 74 to 82.2 Rockwell C, compared to 66 for hardened high-speed steel. Consequently, gripping devices made of it will bite into steel. The nongalling properties adapt the material to applications where frictional loads and the allied problem of wear resistance are involved.

Carbide die rings give phenomenal performance in the drawing of shell cases. Carbide strip mill rolls reduce hard materials like 1.10% carbon steel razor-blade stock in fewer passes than steel rolls, and up to 100 times as much material can be rolled before regrinding is necessary. Also, the surface finish on the rolls is reproduced within the strip, and the strip is not so likely to wrap around the roll and shut down the mill. Because of their high torsional strength, the carbide rolls can be driven through journals instead of by back-up rolls, and a safety factor of 5 can be obtained in their design. Straight rolls of 2⅜-in. dia. and 40 in. long roll 36-in.-wide strip to close thickness tolerances, so small is their deflection. Approximately 12,000,000 heavy-gage military oil cans were seamed with a carbide roll, whereas steel rolls were worn after processing 100,000 pieces. In overhung tool elements and mandrels, a 3-fold gain in stiffness can be obtained by making the component of solid carbide. —AMERICAN MACHINIST

HIGH-SPEED HOUSING

Using exterior construction of precast concrete, made on the site and crane-hoisted into place, a Philadelphia builder plans to complete 10 to 15 homes daily.



MOVABLE WALLS—To contain facilities for small-scale factory operation and pilot-plant testing of wet processes, the new factory-laboratory of Johns-Manville Corp. features movable asbestos-cement wall panels that button into notches in special steel studs, with provision for carrying concealed service piping. Other notches are provided to support wall brackets. A removable rear wall permits extension of the building. —ENGRG. NEWS-RECORD

The 7-room-and-garage, 1-story houses are to be ready for occupancy in little more than a month. Cost will be under row-house construction. —BUSINESS WEEK

AIRCRAFT FUEL SAVED BY PSYCHROMETER

Designed to obtain comparative readings of temperature and humidity in Kwajalein weather flights, a simple wet- and dry-bulb psychrometer may become standard equipment on big airliners as a fuel control. Backfiring in aircraft engines with carburetors has been traced to humidity variations. From psychrometer readings, experimental tables giving the relationship of saturation vapor pressure (in inches of mercury) to temperature have been obtained, and from these tables maximum fuel economy can be achieved through power settings. Real economy of fuel consumption might be realized on long flights of exceptionally large aircraft like the XB-36.

To determine, for example, a humidity-power-loss evaluation when the air is 27° C. and relative humidity 90%, saturation vapor pressure (1.2) is found in the table opposite 27° C. Multiplying this by the relative humidity gives 1.080, which is the actual vapor pressure sought by the flight engineer in evaluating his power settings. —AIR TRANSPORT

REMARKABLE DIE CASTINGS

Aluminum and magnesium die castings made by the Germans for use in wartime communication equipment were unusual not only in size and intricacy but in freedom from blow-holes and surface defects. They were made in special vertical presses, the molten metal being introduced from the bottom of the stationary lower die. For small castings, a piston forced molten metal into the die, through a gooseneck mounted in a cast steel melting pot. For large castings, 1,500-lb. air pressure was used for injection, a clamping force of 4,500 lb. being applied to the die closure. Some hazards were involved. —PRODUCT ENGRG.

HALF AN AUTO—Designed for 1½-car families, the new 250-lb., $300 Salsbury motor scooter has but 3 controls—steering bar, throttle, brake—because it is equipped with an automatic clutch and transmission. With the 6½-hp. engine, mileage is 65 per gal.; speed, 40 mph.; hill-climbing ability, good. Groceries can be carried home in a rear compartment. —BUSINESS WEEK

BACTERIA BOMB

Among recent U. S. innovations in guided missiles is the GB-11, which can be launched from an airplane and directed by radio to deliver bacteria, chemical sprays, or gas to a target. Guided missile research has progressed so far that "within 18 months it will be possible to shoot a rocket to the moon." Radar, television, heat-seeking, light-seeking, and radar-seeking control devices have proved successful. —AVIATION NEWS

RAPID EGG ANALYSIS

For determining fat content of dried eggs, the sample and HCl are heated in a "Paley" test bottle which has graduated neck off center and a special opening for sample. After digestion (30 min.), butyl alcohol and sulphuric acid are added, the solution centrifuged, colored, and the fat content read from the graduated neck. The method compares well with, and is more rapid than, the modified Babcock method.—FOOD INDUSTRIES

DARRIN DEVELOPMENT — Front fenders and hood are one piece in the new Howard Darrin car. Rear panel is 1-piece, reducing body stampings to 4. Weighing only 2,400 lb., the 100-hp., $2,000 car is said to have 25% better acceleration than competing cars. It has torsion-bar suspension and low center of gravity. A 6-in. box-frame chassis forms the outside structure, serves as a side bumper. Hood, windows, doors, and front seat operate hydraulically. —BUSINESS WEEK

SHORTCOMINGS OF COLD CATHODE LAMPS

Relative merits of cold cathode tubing and incandescent lamps for backlighting theater marquee sign lettering were studied recently. Winter temperatures, not appreciably affecting incandescent lamps, decrease the light output of cold cathode tubes slightly at 43-28° F., by ⅓ at 13°, by ½ at 0°. Initial cost and annual lamp replacement charges are greater for cold cathode lights, but consumption and utility charges are less. Where incandescent consumes 17.2 kw., cold cathodes consumes 6.7 kw.; replacements compare as $92:$190 annually. While the pure white effect of the cold cathode tubes is an advantage, when a single tube burns out, large areas are darkened. —ELECTRICAL CONTRACTING

QUICK TOOL SERVICE

As many as 40 tools may be needed for a machine setup job, but they are delivered where needed within an hour after requisitioning under the tool-crib service system of Van Norman Co. And the planning department gives the tool crib an hour or more advance notice, so there are no delays. Tools for a particular job are kept together as a kit, in good condition. Only one loan order, bearing the kit number, need be filled out to obtain the tools.

Because some special, expensive tools are not kept in the kits, master kit cards show which are stored by classifications, which with kits.—AMERICAN MACHINIST

FREIGHT-HANDLING DIRECTED BY PHONE

To facilitate handling of 90 to 120 thousand packages per day in its New York Terminal, the Railway Express Agency has installed a 2-way communication system throughout the building. Leaving platform space clear, 25 sound-powered microphones are suspended on pulleys at strategic spots and 42 paging horns are placed among the 6 tracks and 4 loading platforms. A central control station permits the supervisor to direct all loadings and unloadings, to secure immediate contact with key personnel, and to locate particular shipments readily. A second set of master controls in the agent's office allows orders or enquiries to be issued from there. About 3 miles of wire was used in the communication system.—ELECTRICAL WHOLESALING

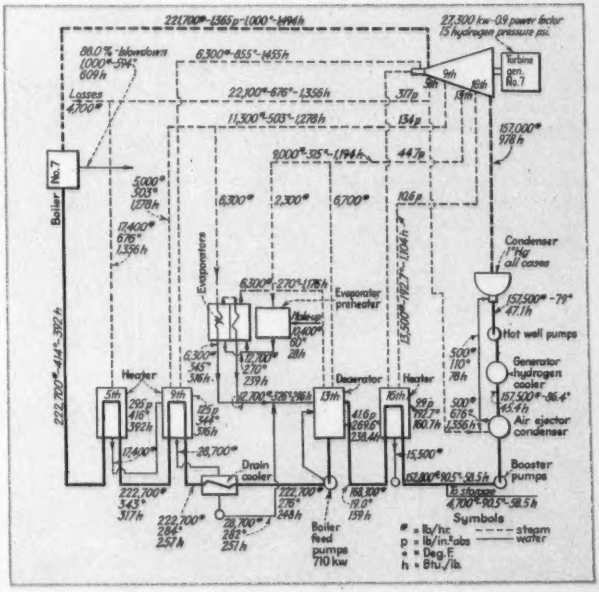
To Use Steam at 1,000° F.

Development of chrome-molybdenum piping permits new high in temperature. Other innovations also made in steam plant and turbine

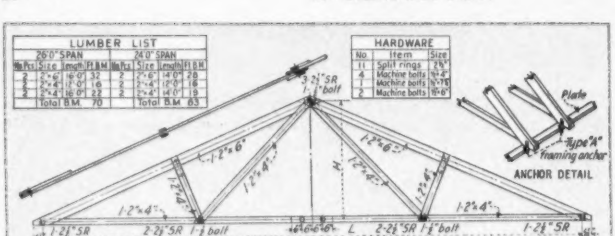
A new high in steam temperature—1,000° F. at 1,350 psi.—will be set in the 30,000-kw. extension No. 7 of the Atlantic City Electric Co. power plant. Development of chrome-molybdenum piping with the high chrome content of 2% inhibits graphitization, the last barrier to 1,000° F. operation. A single 310,000 lb.-per-hr. Foster Wheeler boiler will supply the high-temperature steam to a single-cylinder General Electric turbine.

In the heat cycle (diagram) there are 4 stages of extraction to 3 closed heaters and 1 positive-pressure deaerating heater. The drips from the high-pressure heaters are all cascaded to the deaerator so that no water is delivered to the boiler which has not been degasified. To avoid the chemical problems involved in treating the water, 2 makeup evaporators will be used, these being served by a single preheater and arranged for either parallel or series operation, as capacity requirements dictate. A high percentage of makeup can be produced even under light-load conditions. In respect to thermal performance, better than 11,000 Btu. per kw.-hr. is expected.

Positive automatic control of final steam temperature, during load swings, is accomplished in a condenser-type heat exchanger. Steam on the shell side is condensed by 400° F. boiler feedwater flowing through the tubes, preventing contamination of the steam. The condensed steam passes into the superheater elements along with the noncondensed portion and is re-evaporated in passing along to the radiant superheater section. Steam temperature is controlled by varying the quantity of water passing through the tubes. Final superheating occurs in the convection section. Inherent compensating characteristics of the radiant and convection sections keep to a minimum the amount of condensing.



Heat balance for 27,300-kw. generation in unit No. 7 of Atlantic City Electric Co., which will use 1,000°F. steam at 1,350 psi.



PREASSEMBLED RAFTERS — Designed to save up to 400 ft. of lumber in a 2-bedroom house, a new trussed rafter eliminates heavy bearing partitions, has only 4 basic members plus 2 scabs. Production-line methods can be employed to make it. —CONSTRUCTION METHODS.

Water circulation through the heat-exchanger-condenser tubes is controlled by a motorized valve which receives impulses both from temperature and boiler gas flow.

The turbine is the first to have an under-speed release on the governor. This permits economy through fixed-load operation with the control valves positioned by handwheel so that they will not respond to small variations in frequency but will revert to governor control in case of abnormal variations.

This turbine also is the first to have centrifugal oil pumps, instead of gear pumps, saving 40 hp.—ELECTRICAL WORLD

PHTHALIC ANHYDRIDE FROM ORTHO-XYLENE

Phthalic anhydride, long playing a major role in synthetic resins and coatings, is being manufactured from ortho-xylene by Oronite Chemical Co. This emphasizes the swing of the synthetic organic chemical industry away from coal tars and towards petroleum hydrocarbons.

Preheated air and vaporized o-xylene are fed into tubes where V_2O_5 base catalyst brings about, in less than 1 sec., oxidation to phthalic anhydride. Rate of feed, temperature, and air ratio are carefully governed to prevent uncontrolled oxidation. The resultant vapors are cooled in heat exchangers, the anhydride crystallizes out, is melted and pumped to a primary still, then is solidified in the white, granular form ready for shipping. Yields compare very favorably with the best of those from the naphthalene process. Final product analyzes 99.7% minimum phthalic anhydride. —CHEMICAL ENGRG.

ITALY'S TEXTILE MILLS UNIMPAIRED

With 95% of her textile plants intact, and 200,000 skilled textile workers available, the Italian industry is ready to work for outside firms, retaining part of the output in recompense. Due to the shortage of coal, operation of the rayon industry is a major problem. The U. S. has extended $25 million credit to Italy for cotton purchases. —TEXTILE WORLD

CAMLESS AUTOMATIC—Interchangeable cams are eliminated by the use of quadrant linkages which allow infinite adjustment for quick, accurate setting of the turret and 5 cross-slides in a multiple-spindle automatic bar machine developed by Warner & Swasey Co. Sliding adjustments (above) set all feed working strokes from zero to maximum but retain the fast-approach feed stroke. Cross-slide strokes are similarly controlled. —PRODUCT ENGRG.

Global Weather Forecasting

A new weather-predicting technique, established for the A-bomb projects, gives the accuracy needed in air transport operations

No reliable data on mid-Pacific weather was available when the Bikini experiments were first planned, but in less than 2 months a Weather Control on Kwajalein was producing serviceable forecasts to aid surface preparations and flight training. Soon 75% accuracy in prediction was obtained. Although Bikini was more than 200 miles northwest of Kwajalein, authorities confidently stated, 11 days before, that A-day would provide good visibility.

Reporting stations were established at widely separated locations: Wake Island, Majuro Island, Tarawa, Eniwetok Island, and 2 rescue ships along air routes. From these came surface weather reports and balloon observations, both radio-sonde and rawin.

From Kwajalein, daily weather flights of 2,500 miles were made, in 4 general areas, by B-29's and Navy reconnaissance planes. Each plane, competently manned and with adequate instruments, gave the skilled weather forecaster a 200-mph. sky tour and a critical look at conditions extending over an area of 500,000 sq. miles. Instrument information was evaluated with visual observation. Cloud levels and wind readings were reported in flowing sequence, and with far greater accuracy than would be possible from the ground. A radar scope picked out weather fronts. In these flights, the planes flew a millbar pressure course on flight levels which varied with each leg of the pentagon course, and as predetermined by the staff weather officer.

Despite the high costs, and some overlapping with in-flight reports from regular airlines, future global aviation will be influenced by the accuracy of specialized aviation weather service. Plans are under way to base 12 weather planes at Honolulu and 12 in the Philippines. Airlines will probably be provided with long-range weather surveys made on great circle flights. —AIR TRANSPORT

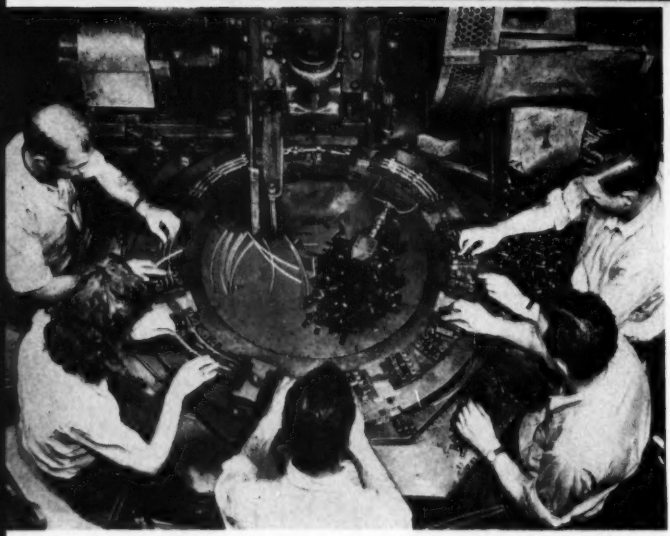
MASTER MOLDS FOR CUSTOM CAKES

Bakery departments of A&P stores provide catalog-order service in 80 varieties of frosted cakes, designed for 32 special occasions, such as weddings. Each of the original cakes is baked in the A&P laboratory and hand decorated. Then a clay mold is made of the decorations and a copy sent to each bakery. From this the intricate frosting design can be reproduced quickly, and easily, so that special-occasion cakes cost 50¢ to $1.25 per lb. compared to present cost of $2 to $3. —BUSINESS WEEK

FACTORY FOR CHINA

China will build a $35,000,000 electrical manufacturing plant to make generators, transformers, meters, and relays, under American patents. To employ 3,800, the factory will be equipped by American engineers.—ELECTRICAL WORLD

DESK-RADIO-PHONOGRAPH—One side of this 18th-Century-style desk has a radio, and the other contains an automatic, slide-out record-changer. Lear, Inc., is the producer. —ELECTRICAL MERCHANDISING



SPEEDY DIAL ASSEMBLY — Multi-station dial assembly with hydraulic stamp press turns out 28 curved track sections a min. in the Lionel toy-train plant. Man on right inserts 1 tie in jig, keeps second operator supplied with parts, manipulates "on and off" foot switch. Next man places 2 more ties in jigs, and successive operators place 1 rail in position. Extra station at upper left permits inspection before assembly passes under press. Tandem air jets blow the completed track section out of the jig into a chute. —FACTORY

SYNTHETIC-FUEL PLANTS NEARING COMPLETION

Conversion of war-time ammonia plants into coal-hydrogenation and gas-synthesis factories is under way. A pilot plant for producing synthetic oil and gasoline from coal is expected to operate early in 1947. Oil shale deposits are estimated to contain 92 billion barrels of recoverable oil, and oil-shale plants will be functioning before end of 1946. The use of large quantities of waste agricultural products for the production of synthetic liquid fuels is being investigated. Present estimates place the production costs of synthetic fuels at 12-25c a gal., but with methods learned from Germany, costs should be reduced. —COAL AGE

SO DISABLED CAN DRIVE

Special equipment enabling disabled veterans to operate an automobile has been installed, free of charge, on 700 cars in the past year by Ford Motor Co. Control attachments for the autos come in 4 variations developed to compensate for any combination of amputation. For leg amputees, a single lever operates valves controlling vacuum power cylinders which operate the clutch, throttle, and brakes. This system costs Ford $165. The simplest set of accessories, for those who have lost an arm or hand, consists of a grip on the steering wheel and an electric direction signal. This set costs $30. —BUSINESS WEEK

500-MILE, 230-KV. POWER LINE BELIEVED FEASIBLE

After an intensive study of the whole problem of long-distance power transmission, Bonneville Power Administration sees a solution in 230-kv. lines compensated by series capacitance. It appears possible to transmit as much as 175,000 kw. per 230-kv. circuit approximately 500 miles at an overall cost of about 1¼ mills per kw.-hr., at substantially 100% load factor. Two low-cost 230-kv. lines with series compensation are expected to transmit as much energy as two 330-kv. circuits, with greater economy and flexibility.

With this method, capacitors are connected in series with the transmission line at intermediate stations and neutralize a portion of the line reactance, permitting more power to be transmitted.

Series compensation introduces a number of new design and operating problems, but the advantages over the use of higher voltages suggest efforts to evolve a solution. —ELECTRICAL WORLD

NO JIGS NEEDED

Savings up to 20% in drilling, tapping, reaming, and boring time, along with elimination of jig costs, are claimed for the new Man-Au-Trol hydraulic work positioner. Bullard Co., its developers, will scrap $500,000 worth of jigs, tools.

The workpiece is clamped to a heavy flat table which is moved to preset positions under a fixed machine-tool spindle by combined action of a master hydraulic cylinder and smaller lateral and longitudinal cylinders. —BUSINESS WEEK

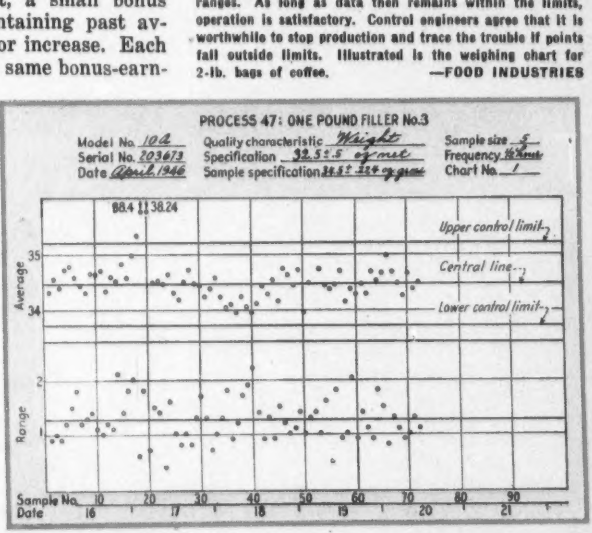
WORKABLE BONUS

A bonus plan in operation at Sonoco Products Co. sets a monetary value on each element of cost over which the supervisor has control, by establishing a difficult but not impossible goal. Rewards are in proportion to performance. Maximum amount of bonus for each element is based on the saving to the company if goal is reached, and is a specific percentage of supervisor's salary. Bonus revisions each year correct for changes in manufacturing procedure, and place emphasis on improvement, a small bonus being allowed for maintaining past average, a larger bonus for increase. Each participant is given the same bonus-earning possibilities he had the previous year.

Since the amount of bonus earned in any given month is determined entirely by the efficiency at which the department operates, there is no danger of bonuses running wild, and all participants have equal opportunity. The plan functions satisfactorily under conditions of extreme fluctuation, is much better than the previously used bonus-or-debit system operating from inaccurate "normals," can be applied in new departments before operations are completely standardardized. —FACTORY

CANADIAN MINING BOOMS

Exploration, drilling, shaft sinking, underground development and a wave of mining promotion are proceeding at the greatest rate in the history of Canada. Known mining districts are being extended, new areas uncovered, in northern Ontario and Quebec. Finances are already at hand to carry out the work. Iron, manganese, gold, copper, and zinc areas are being developed. At present only 6% of Canada's mineral production is from mines that were discovered since 1930. —ENGRG. & MINING JOURNAL



QUALITY CONTROL CHART—Simply a plot, on graph paper, of a series of sample averages, a chart such as this is sensitive to small or gradual changes in any repetitive process or operation. Small samples of the product, taken at regular intervals, supply the data. Central line (process average) is computed by averaging the sample averages. Control limits are determined from the 2 extremes in the data obtained at any one time, then averaging all these ranges. As long as data then remains within the limits, operation is satisfactory. Control engineers agree that it is worthwhile to stop production and trace the trouble if points fall outside limits. Illustrated is the weighing chart for 2-lb. bags of coffee. —FOOD INDUSTRIES

New Fields for Welding

Halves weight of big gear. AC. welding applications extended. Spot welding speeded. New way to weld white metal

The greatest unexplored field today is the design possibilities inherent in the fabrication of welded steel. Some of the potentialities are indicated by the following recent developments.

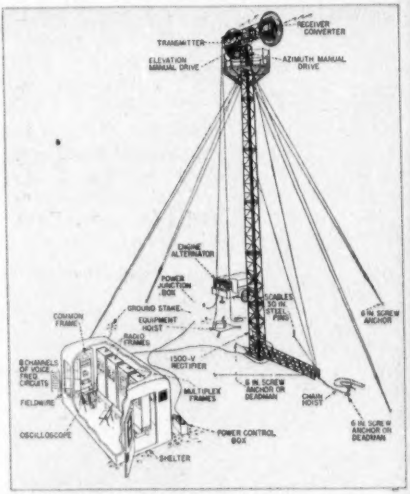
Huge Gears Made—Fabrication by welding cut 10 tons off the weight of a 20-ton heavy propulsion gear as compared to casting the body and shrinking a forged band onto it. A welded gear blank for a naval transport is made of a forged rim, 4 webs and a hub, has a diameter of 140⅜ in., a 37-in. face, weighs 32,000 lb. Made of 2 parts joined by a circumferential weld, the rim contains 0.35-0.40% carbon, 0.90% manganese, has a Brinell hardness of 160 to 190 after stress relief. The webs are flame-cut from 1⅛-in. steel plate, ground to remove torch marks or undercuts that might cause failure, and formed to a 5-deg. conical slope on a 1,500-ton hydraulic press. Then inside and outside diameters and welding kerfs are machined.

A ring-type burner heats the bored rim to 250° F. while the forged or cast (and machined) hub is placed in the center and the webs assembled. The rim is cooling as the gear is being welded, tending to counteract contraction of the weld metal. Heating to 1200° F. at a rate of 100° per hr., maintaining that temperature for 6 hr., then cooling at 100° per hr. stress-relieves the rotor.

AC. Welding Progresses—With electrodes developed during the war, more than 90% of all metal-arc welding can be accomplished by the ac. process. These electrodes include the E-6011, a new E-6013 variety, and a complete line of ac.-dc. stainless-steel electrodes. The new E-6013 produces a flat fillet profile, and in lap welding gives a satisfactory bead appearance without breaking down the corner of the top plate, as with hotter electrodes. It has remarkable arc stability and good weld-metal qualities.

Well over half of the hard-facing applications encountered can be ac. welded, using austenitic steels as well as the ferrous types.

Better Spot-welder Transformer—In the customary stored-energy electrical welding system, the long period required for current decay, because of residual magnetism in the transformer core, restricts welding speed. This difficulty is claimed to be overcome by using a trans-



WAR RADIO IN PEACE USE—Perfected during the war, microwave sets for distance communication are being applied to domestic telephone circuits. The Bell Telephone installation between Chicago and Milwaukee can handle telephone, telegraph, and facsimile. The set is a combination uhf transmitter and receiver with multiplex arrangements providing 8 two-way radio telephone channels between line-of-sight points. It has been used at distances exceeding 100 miles, and by placing the sets back-to-back a radio relay of any desired length is possible. The relatively new pulse-position modulation is used. —ELECTRONICS

DIRT THROWER—Reported to build a mile of farm terrace in a 10-hr. day, the tractor-drawn Whirlwind has a special 18-in. moldboard plow which rolls the dirt against a big screw that hurls it 10 to 20 ft. to one side. An hydraulic device controls screw speed and throw. Servis Equipment Co. developed it. —BUSINESS WEEK

former of the air-core type, constructed like a solenoid, with an armature for producing follow-up forging pressure. Current discharge occurs in 1/500 sec., making the weld before an appreciable amount of the heat can dissipate.

To shorten the current build-up interval, resonance at several hundred cps. is utilized, and in such a circuit the electron switch must conduct in both directions. For this, a double-ended symmetrical tube was developed.

New Way To Weld White Metal—Chief obstacle to welding white metal is the heavy, hard, oxide coating which has a much higher melting point than the metal itself. With a new oxyacetylene welding technique, the metal and welding rod are brought to the melting point together. Then the metal is scraped with the rod, causing the oxide coating to crack and permit the molten white metal from the rod to flow into the base metal. —WELDING ENGR.

RADIOACTIVE DEATH LINGERS ON A-BOMBED SHIPS

The radioactive peril to crews from an underwater atom bomb burst is extraordinarily high because fission products trapped in the waterspout are showered over the ships so that they become unlivable for days. The Japanese battleship *Nagato* was so "hot" 3 days later (it subsequently sank) that a man standing on her deck for 1 day would have received radioactivity equivalent to 1,000 chest x-rays, or 1,000 times the safe exposure.—*From a special report to all McGraw-Hill publications.*

MOVABLE PLANT PREPARES COAL

Blending coal from 2 open pits in Pennsylvania, a 3-section diesel-powered plant can be erected in 3 days, moved and put in operation in less than a week. Screening and crushing 800 to 1,000 tons in 8 hr., the plant consists of a hopper section with 42-in. reciprocating feeder, a housed-in center section with lip screens, slate chute and bin, crusher and 665-hp. diesel, and a flight conveyor and chute for loading into railroad cars. The plant is assembled with the aid of a railway crane. —COAL AGE

PUSHBUTTON TRAMRAIL

Inclined storage racks, combined with an automatic tramrail system, saved 75% in the man-hours required to handle full and empty 1,000-lb. rayon beams in a Scottsville, Va., textile plant. The racks are sloped ¼ in. per ft. to give easy access to the beams in the order received. Pushbutton controls regulate delivery of the beams to any one of 87 machines. —FACTORY

FIRST SUPERSONIC PLANE

Bell Aircraft Corp. has built a rocket-powered airplane, the XS-1, which the test pilot will attempt to fly faster than 900 mph. It will be taken to 35,000 ft. by a B-29 for launching. —AVIATION

TECHNICAL SHORTS

Cut Highway Deaths—Hollow light-poles, mounting shielded lights 6½ ft. above the ground, cost less than 1/5 as much as the old type and collapse on impact, thus reducing fatalities of motorists who collide with them. —ENGRG. NEWS-RECORD

Raising the Roof—To add a second floor to a 1-story steel frame plant in Tarrytown, structural steel for the second floor was assembled on the ground inside the structure, and the existing columns framed into the new steel. Second floor framing, together with the roof, was jacked up 14 ft. and new first story columns inserted. —CONSTRUCTION METHODS

Easy To Handle Plastics—Plastisols—powdered vinyl resins suspended in a plasticizer—have several potential uses. Being fluid, they can be applied to textiles in almost any film thickness with simple roller or knife coating equipment. And they can be molded without pressure. Heat-treatment at 300-350° F. converts the material to a finished resin in seconds. —BUSINESS WEEK

Rotor-kite—Carrying an observer aloft to spot targets, a German flying contraption had helicopter-type blades which were turned by relative air velocity. It was attached to submarines by cable, pilot having telephone communication with sub. —AVIATION NEWS

Drinking Water Improved—Using sand filters as a contact bed following break-point chlorination, a filtration plant in Baltimore removed excess manganese from raw water. The method also reduced bacterial count and taste complaint, and gave a 22% cost saving. —ENGRG. NEWS-RECORD

Electronic "Slow" Signal—Chicago and North Western Railway is testing a radio device which broadcasts slow-down warning signals from one train to another approaching on same track 5 miles away. —BUSINESS WEEK

Packaged Fares—Selling tokens (7 for 50 cents) to its passengers, a bus company in Albany cuts down loading time by handing the purchaser a small sealed envelope containing 6; the 7th is loose, ready to be deposited as fare. —BUS TRANSPORTATION

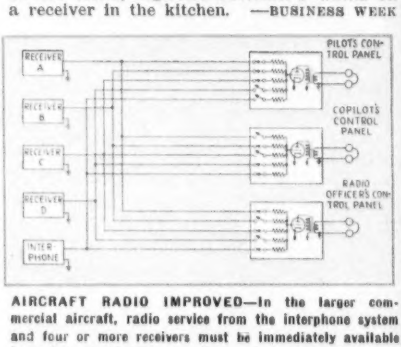
Palletized Handling—Shipment of canned juices was speeded up during the war by stacking several on a pallet for handling as a unit the cases being held together by spots of glue. Pallet exchange pools, lightweight metal, and expendable pallets will aid in handling commodities. —FOOD INDUSTRIES

Locating Cable Trouble—To locate "grounds" in buried cable, 2 wires (No. 14 and No. 6) running above ground parallel to cable, are connected to each end of the cable. A 6-volt storage battery is inserted in the No. 6 wire circuit. One contact of a voltmeter is grounded above the cable, the other contact is moved along the No. 14 wire. When voltmeter reads zero, ground fault lies directly below contact. —ELECTRICAL CONTRACTING

Anchor for Trucks—To prevent a service truck from skidding backwards while pulling heavy loads with a power winch, the rear wheels are rolled onto 18-in. sections of channel iron with the flat side up. The irons are held under the wheels by chains bolted to frame at rear, are carried on hooks when not in use. —POWER

Concrete River Mats—Flexible concrete mats, made of 1½-in. thick reinforced blocks, are rolled on launching drums, later unrolled and sunk to form erosion-resistant blankets on sloping bank. —CONSTRUCTION METHODS

Pushbuttons Order Meals—An electrical selector under test in a Memphis restaurant has pushbuttons numbered to correspond to dishes on the menu, registers customer's wants on a receiver in the kitchen. —BUSINESS WEEK



AIRCRAFT RADIO IMPROVED—In the larger commercial aircraft, radio service from the interphone system and four or more receivers must be immediately available in various combinations to pilot, copilot, and radio officer. For this purpose, isolation amplifiers allow a maximum of different connections without crosstalk or attenuation. With the above arrangement, the pilot hears receivers A, B, C; copilot hears B and D; radio officer, A, C, and the interphone. All signals are at the same level. Four extra tubes are needed, one (not shown) being in the amplifier power supply. Resistors from each switch arm to ground are not shown. —ELECTRONICS

Radio Controlled Warehouse—In the new 600-carload warehouse of Eastman Kodak Co., 2-way radio communication between foreman and workers speeds handling of materials by pallets and lift trucks. —FACTORY

Lowering the Roof—Flattening sawtooth sections of a textile mill roof in Spartanburg was done by devices which supported the high ends of the roof beams and lowered the sections as nuts and swiveled housings, to which beams were cabled, rode up threaded rods anchored to the main roof steel. Operations in the mill continued as eighteen 80-ton, 170x28-ft. sections were lowered at 3 ft. per hr. —CONSTRUCTION METHODS

Fly Ocean Without Pilots—Two robot, radio-controlled B-17's recently created a sensation by flying from Hawaii to California without pilots. —BUSINESS WEEK

Straps Hold Concrete Forms—Pouring concrete to resurface columns has been done more safely, more rapidly (11 columns in 1 day), and with more uniform finish by holding the forms in position with ¾-in. wide, 0.025-in. thick, machine-applied steel strap No shoring is needed. —ENGRG. NEWS-RECORD

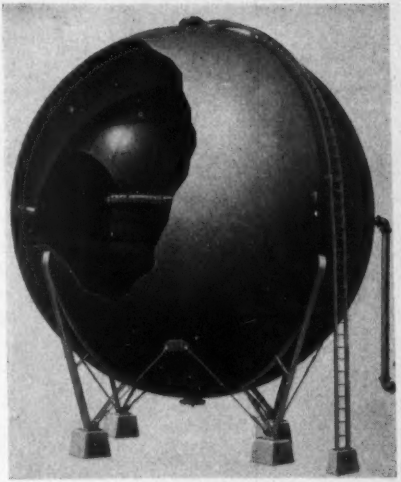
Light Plane Quieted—With the addition of less than 3 lb. of weight, the Stinson *Voyager* 150 is well sound-proofed by Fiberglas blankets around the cabin. —AVIATION NEWS

Textile Tools—Reaming and grinding tools are finding new uses in the weave room. New pickers going into the box can be smoothed by emery wheel and buffer to prevent jerkin's. Enlarging the hole in a leather picker by a rotary file will double the life of the picker. Reaming a shuttle-point hole in a leather picker can be done quickly by rotary file. When rawhide pickers heat up and bind on the picker rod, they can be rapidly cleaned by these tools. Rough edges of castings, likely to shear a retaining cotter, can be polished by emery wheel. —TEXTILE WORLD

Lost-and-found Friends—Articles left on street cars in Detroit are returned in sturdy paper shopping bags to their owners. Enclosed is a card which expresses the company's regret that the patron had been inconvenienced. —BUS TRANSPORTATION

No-line Phones—Microwave radiotelephone equipment, linking Catalina Island and Los Angeles, will simultaneously transmit 8 talking circuits. —SCIENCE ILLUSTRATED

Bridge Shimmy Recorded—Vibration of the Golden Gate Bridge is being studied by means of 10 recording instruments located at intervals on the bridge. Vibration causes movement of weights suspended on springs, and pens record the motion on revolving drums. Damping is by coils of brass, attached to the weights and suspended in oil. All mechanisms are synchronized. —ENGRG. NEWS-RECORD

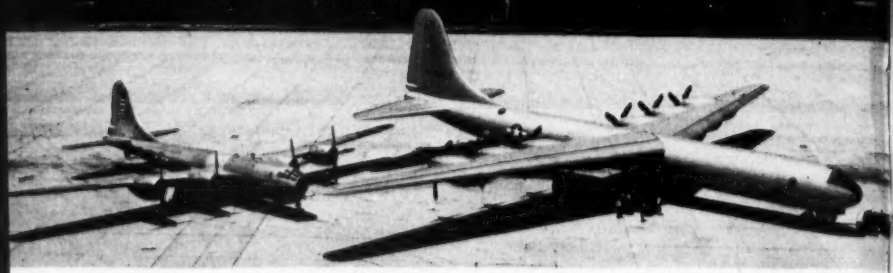


VAPORSPHERE — This 5,000 cu. ft. steel sphere of Chicago Bridge and Iron Co., connected to vapor spaces of flat-bottom tanks containing volatile liquids, reduces evaporation losses. A flexible, hemispherical membrane is attached to the inner equator of the shell, and vapor is stored beneath it. When increasing temperatures cause the vapor to expand, the sphere gathers the excess, and returns it later to the cooled tank. —CHEM. ENGRG.

Flexible Radio Wave Guides—Design and construction of microwave equipment now is facilitated by flexible guides for electromagnetic waves. One, used in large quantity, is made of interlocked spirals of metal strip, is rectangular in shape. A second consists of a stack of round metallic wafers with rectangular holes, the wafers being spaced slightly and held in place by an internally ribbed synthetic rubber jacket. A third is made by corrugating a thin-wall, seamless, rectangular metal tube. —ELECTRONICS

Rotated Welding—Producing foundation piles as long as 120 ft. for a building in Boston, pile lengths that require splicing are welded in jigs that rotate the pile to permit downhand welding. Finished splice on 14-in. pile has 9½-in. square plates on one side of web and on each flange. —CONSTRUCTION METHODS

Bean-roasting Control—In Germany, cocoa beans were commonly roasted and dehydrated in a globe-shaped Sirocco hot-air roaster. A predetermined moisture content could be obtained by setting the balance arm of the scale (on which the roaster rests) so cooking air would shut off when bean mass has lost required weight. —FOOD INDUSTRIES



WORLD'S BIGGEST BOMBER—So huge that it dwarfs the B-29 alongside, the new XB-36 is the first of an Air Forces fleet to be built by Consolidated Vultee. The ship carries a 30-ton bomb load, ranges 10,000 miles, has a 230-ft. wing span, is powered by six 3,000-hp. engines. Pan American is interested in commercial version. —BUSINESS WEEK

What's New in Aircraft

Jet fighter obsoletes conventional carrier craft; big transport tested; special ships for mountain flying; new helicopter and light plane.

Putting a final damper on further developments of conventional-powered Navy carrier fighter planes, the twin-jet, 5-ton McDonnell FFD-1 *Phantom* has demonstrated good stability at the relatively low deck-landing and take-off speeds. It becomes airborne in runs shorter than 400 ft., can take off 2 min. after engines are started, flys well over 500 mph., and readily rises again after a bad landing approach. It is powered by Westinghouse axial-flow turbo-jet engines . . . G&A Aircraft is building a 4-place helicopter with an automobile-type cabin, small dual tail rotors, and structural consolidation of the tailboom into a conventional-appearing fuselage. . . . New Thalman *Special* T-3B light plane has stabilizer at top of tailfin, out of the propeller wash, to give craft greater stability and maneuverability . . . Designed for mountainous areas, a twin-engine (200 hp. each) utility transport of National Aircraft Factory of Mexico carries 6, cruises at 130 mph., lands at 47 mph., 7,000 ft. above sea level, and has a 620-mile range. It is made of plywood covered with doped fabric for a smooth finish. —AVIATION NEWS

Wings which sweep forward instead of back are used on a Swiss 4-6 place, single-engine airplane designed for mountain flying. The craft cruises at 125 mph., will fly safely at 47 mph. when flaps are used. Built by Pilatus Aircraft Co., it has wings of wood construction, with plywood skin. Fuselage is metal skin-stressed construction. —AVIATION

The C-74 Douglas *Globemaster*, now under test by the Army weighs 145,000 lb. (gross), has a wing span of 173 ft., 3 in., is powered by four 3,000-hp. engines. Military counterpart of the DC-7, it uses 3 electric hoists to handle cargo, has a range exceeding 7,000 miles, and a ceiling of 28,000 ft. —BUSINESS WEEK

HOT OR COLD HANGAR

To test the largest Army aircraft at extreme temperatures, the floor of a new 200 x 250-ft. hangar was made of 15 in. of glass block resting on a 7-in. plain concrete slab and covered with 12-in. reinforced concrete. For walls and ceiling, 13 in. of glass fiber insulating material was used. Heavy insulated door leaves are on trucks. —ENGRG. NEWS-RECORD

HORMONE FROM SASPARILLA

Testosterone—a male hormone used in treating impotence and the disorders accompanying the male climacteric—is extracted from sasparilla root by Syntex, Inc., Mexico City. Production costs compare favorably with extraction from the spinal cords of animals.—BUSINESS WEEK

OPENS NEW ERA IN MICROSCOPY

Many microorganisms and industrial materials too transparent for study under an ordinary optical microscope now can be investigated—without staining—under the new phase microscope. This instrument is made by adding a diffraction plate to the objective lens system of a standard microscope. This increases, reduces, or reverses light contrast in the image to make details visible in the specimen. A diaphragm also is used to control the light concentrated on the specimen, and an auxiliary telescope is employed in centering the equipment.

In biological research, tiny chambers, constructed on the microscope slides to imprison living organisms, can be utilized to supply nutrients and oxygen and to remove toxic excretions. Thus the effect on the organisms of drugs and vitamins can be investigated. —BUSINESS WEEK

BRAZIL'S BIG STEEL PLANT

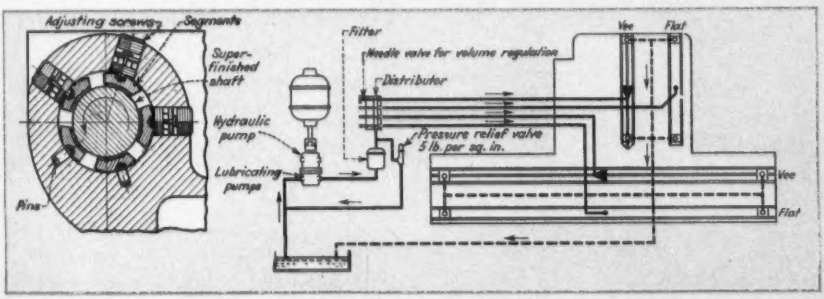
A new steel mill with a capacity of 350,000 metric tons annually has been built at Volta Redonda by National Steel Co. of Brazil. The mill has 55 coke ovens, a 1,000-ton blast furnace, three 150-ton furnaces, a 600-ton molten pig-iron mixer, 52 overhead cranes, a 2,700-hp. powerhouse, as well as stripping, galvanizing, tinning, and finishing facilities.

Steel and equipment for building the mill (totalling 168,000 tons), was shipped 8,000 miles to Rio de Janeiro, then hauled by train 76 miles through mountainous country. Railroad tunnels and sharp curves complicated the transportation of prefabricated parts. Much erection equipment was improvised on the job. —ENGRG. NEWS-RECORD

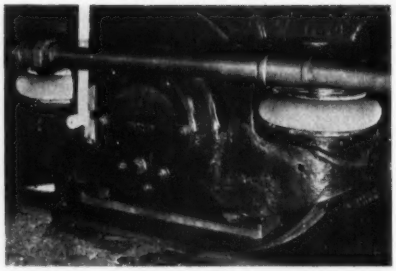
TUCKER'S TORPEDO CAR WILL BE DIFFERENT

The engine will be an aluminum casting, with cylinder walls of fused bronze, in the first model car to be built by Tucker Corp. To be transverse of the car at the rear, the 6-cyl., 150-hp. engine will drive the rear wheels through 2 engine-mounted torque converters, eliminating transmission, clutch, rear axle, and differential.

The conventional chassis will be obviated by welding the steel body shell to a frame of welded steel tubing. Front fenders and headlights will turn with the wheels. Instruments are to be on steering wheel. Curved glass windshield is planned. There will be luggage compartments at both front and rear of the vehicle. —AMERICAN MACHINIST



5-PIECE BEARING—Grinding-wheel spindles run on bearings consisting of 5 equally spaced segments (left) in the new hydraulically operated grinding machine of Cincinnati Grinders, Inc. The segments are located by pins and adjusting screws that allow pivoting. Spindle rotation draws oil under the segments, creating a high-pressure wedge-shaped oil film. Main motor drive cannot be started until bearing compartment is filled with filtered oil. A pressure switch in the compartment opens at 2 psi., closes at 3 psi., preventing damage to spindle should oil supply fail. Table and cross-ways of grinder (right) are automatically pressure lubricated with filtered oil at 5 psi. —PRODUCT ENGRG.



AIR SPRINGS—Rubber bellows inflated with air to 100 psi. have been installed on an experimental railroad passenger car by Pullman-Standard Car Mfg. Co. Bumps in the track compress the bellows and force air through a control valve into a reservoir. —BUSINESS WEEK

VOLCANIC ROCK MADE INTO USEFUL MATERIAL

Produced by a new process from volcanic rock underlying sagebrush in the western states, X-Rox can be mixed with cement, resins, and other bonding materials for use in products made of concrete, porcelain, clay, and plastic. Light enough to float, fire and moisture-proof, it may be used raw for building blocks and insulation.

To convert the silicious material to a plastic-like substance, it is put under heat and pressure in autoclaves, the pressure being relieved suddenly to explode the material, as in puffing rice. This is cheaper than the standard method of calcining silicas. —BUSINESS WEEK

SLIME CONTROL AGENT

Under the name Pyridose, pyridylmercuric acetate is being offered by Mallinckdrodt Chemical Works as an inhibitor of fungal and bacterial growth. The compound has good water solubility and reacts with the ions in water to form other soluble compounds. For most conditions, 1 oz. of Pyridose is sufficient to control slime in 10 to 15 tons of paper pulp. Concentration of 0.0001% inhibits *Aerobacter aerogenes*, of 0.00005% inhibits *Bacillus mycoides*, of 0.005% inhibits *Aspergillus niger*. —CHEMICAL ENGRG.

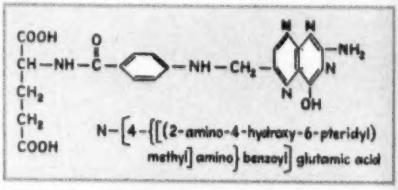
GIANT PUMPS TO PROTECT CINCINNATI FROM FLOODS

Having suffered tremendous losses from floods in recent years, Cincinnati, Ohio, is building a concrete-and-earth dam across Mill Creek to prevent flood waters from the Ohio River from backing up into Mill Creek Valley.

When the Ohio rises about 47 ft. above low water, gates will be closed in a bypass and the entire creek flow pumped over the dam by 6 of the world's largest pumps (1,000,000,000-gpd. capacity). These pumps are of the axial-flow, propeller, vertical-shaft type, and each runner has 4 fixed vanes and discharges vertically through a 6-vane diffuser. An 18-in., 32-ft. long shaft connects each pump to a 6,500-hp., 180-rpm. synchronous motor. Radial gates on the discharge siphons will close when the pumps start and open automatically (by hydraulic control) as the pumps accelerate. This permits more economical motor design and full voltage starting. —POWER

ROCKET-BOOSTED ROCKET

Launched vertically from a 100-ft. tower, the American WAC Corporal liquid-fuel rocket is boosted to supersonic speed in 0.6 sec. by a solid-fuel step rocket which falls away. The liquid-fuel motor uses aniline as fuel, nitric acid as the oxidizer. Weighing 700 lb. at launching, the Corporal is 1 ft. in dia., 16 ft. long. Only controls are 3 fins. —PRODUCT ENGRG.



FOLIC ACID FOR HEALTH—Member of the B family of vitamins, folic acid is expected soon to be added to cold processed foods, and its amounts closely controlled in frozen foods. Present in green leaves, liver, and yeast, the biologically powerful substance is moderately heat stable in pure form, has wide uses in medicine. Plans have been made for large-scale production. —FOOD INDUSTRIES

Controlling World Trade

Prosperity can be expedited by cooperative international action to abolish undesirable features of cartels and commodity agreements

Expanding and increasing international trade is one key to world peace and prosperity. A return to prewar nationalistic policies, to blocs, restrictions, and disciplinatory controls will mean also a return to maneuvering for position—the power politics and power economics that too often in the past have been prelude to war.

Both cartel arrangements and commodity agreements tend to restrict the total volume of international trade and a free choice by producers and dealers of the trade channels through which they buy and sell. The fact that commodity agreements are negotiated by governments is no guarantee that the interests involved are very different from those concerned with cartel formation. Intergovernmental agreements permit of import-country representation, and it is along these lines that changes in international commodity controls, away from an exclusive concern with producer interests, are to be expected.

Cartel policy by international agreement might take the form of either regulating or curbing restrictive business agreements in foreign trade. International control of a commodity in foreign trade sometimes is necessary, and, in the absence of common action, practices more restrictive of international trade than those inherent in the control scheme are likely to be adopted. Intergovernmental supervision is to be favored. Calling cartels commodity agreements does not, however, solve the problem; if the controls imposed are to bear a reasonable relation to the economic requirements of the situation, very strict conditions for their administration will have to be observed.

On the assumption that this can and will be done, there should be an international convention whereby the signatory powers agree to:

1. Prevent participation of their nationals in international business agreements that fix prices, limit output of exports, allocate markets, or otherwise restrain the flow of goods in international trade. This convention would not apply to the organization of the exporters or importers of a single country in export or import associations.

2. Require the registration by their nationals of the terms of their participation in international business agreements of an enduring character and of such information on ownership of foreign assets or foreign affiliate relationships as may be requested by an International Business Office, to be established.

3. Establish, as an adjunct of an International Commercial Policy Organization, an International Business Office to study, on the basis of information supplied by the participating governments, business practices that tend to restrict international trade and to recommend

CYCLE TRAILER—Shown loading a DC-3, the new Indian motorcycle and trailer combination serves as "errand boy," personnel carrier, and air-cargo pickup and delivery unit. The 180-cu. ft. trailer weighs 900 lb., will carry a 1-ton load, has vacuum brakes. —AVIATION NEWS

BUS TRAIN—Built for Santa Fe Trailways, the 60-ft., 28,000-lb., magnesium and aluminum articulated motor coach seats 40 in foam-rubber, swivel seats (63 with conventional seats), is air conditioned, and has 2 lavoratories (will make fewer stops). The 6-cyl., 275-hp. diesel engine is on a roller carriage under the floor, can be pulled out for repairs or quick replacement. Front and rear steering turns bus. —BUSINESS WEEK

remedial action to the signatory states.

4. To exchange, on a nonrestrictive basis, industrial techniques developed in in government-supported research institutions, and patents and processes acquired, as a condition of the peace settlement, from enemy countries.—"Controlling World Trade," McGraw-Hill Book Co.

RUBBER PADS USED IN SHAPING STEEL

Sheet steel can be formed on hydropresses equipped with rubber pads. At Douglas Aircraft, corrosion-resistant steel, 0.016 to 0.050 in., is formed into such parts as bulkheads, cowl stiffeners, and firewall diaphragm seals. Regular automobile body steels with their lower yield points have been formed experimentally in gages up to 0.156 in. Experience indicates that rubber forming is adaptable to a far wider field than it now occupies. And it is suitable as a starter stage for severely contoured parts, as it eliminates several costly staging dies and operations and delivers a part claimed to be even better for finish operations because the metal is not overworked.

Methods of rubber-forming steel and aluminum alloy (the Guerin process) are similar—in fact, both can be formed simultaneously. Pressure used at Douglas is 1,057 psi.—AMERICAN MACHINIST

PLANTS AND ANIMALS GO BY AIR

Tomato growers expect to get an extra picking from their plants by shipping them (at about $2.50 per 1,000 plants) by air. Arriving in a few hours, the plants grow immediately, eliminating the dormant period. —FOOD INDUSTRIES

Animals find air-travel much easier than surface travel. Race horses flown across the continent were ready for racing after 48 hours; the same trip by surface would require 3-4 weeks of reconditioning. Similar saving in reconditioning time is claimed for breed cows, flown for 24 hr. on a trip which by sea would be 50 days. Racing greyhounds, traveling by air, showed neither the nervous strain or the road-sickness common to them in traveling. —AIR TRANSPORT

AIDS FOR THE BLIND

Weighing 9 lb. and carried in the hand, an experimental device for indicating to the blind the presence and approximate distance of obstacles converts the reflection time of its light beam into audio signals heard in an earphone.

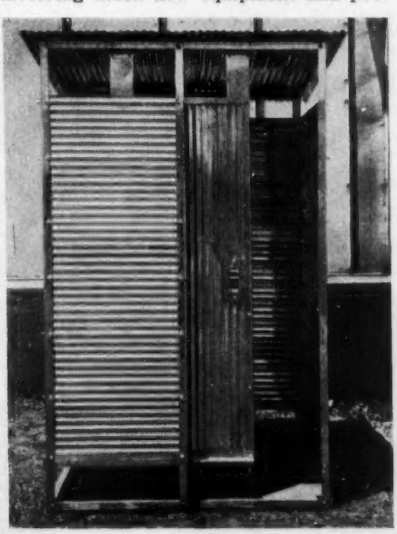
Braille is now being applied to blood-pressure gauges, slide rules, thermometers and other instruments. The electric eye helps the blind to work safely at machinery, and Talking Books (records) and certain sports (e.g., fencing) give wider interests. —SCIENCE ILLUSTRATED

OIL-FIELD PRACTICE AIDS MAGNESIUM MINING

Urgent war-need for magnesium caused engineers in Utah to use a regular oil-field rotary rig and a wire-line core barrel to obtain cores of the highly soluble salts, carnallite and sylvite. Dropping the core barrel and removing the full core barrel at a depth of 3,000 ft. took 15-20 min., where conventional methods would require 3-4 hr. In the halite section of the hole, 1,323 ft. was cored with a recovery of 92.2%. In the 220-ft. carnallite and sylvite section, 93% of the core was recovered. As much as 120 ft. of halite was drilled in a 24-hr. period. —ENGRG. & MINING JOURNAL

PREPACKAGED MEATS?

To maintain quality and appearance in prepackaged fresh meats, improved packages and packing techniques must be developed. If prepackaged, quick-frozen meats become a reality, cutting, trimming, packaging, freezing, and weighing would be done at packing houses, thus involving much new equipment and possibly increasing costs by as much as 10¢ per lb. Retailer's costs would be higher, but selling expense would be considerably lower than with fresh meats. If consumer's preference is sufficiently strong, sum total of all costs can probably be adjusted. —FOOD INDUSTRIES



PSYCHO-SCREENING FOR DRIVERS

In selecting commercial vehicle operators, psycho-physical tests are designed to give the employer an understanding of the employee and his environment, and to bring the employee a better understanding of himself. The tests, consisting of question and answers, laboratory tests, and physical examination, should be valid to detect the capacity or incapability of individuals to become drivers. Psychotic individuals may become depressed, boastful, foolhardy, or disinterested and thus be poor or accident-prone drivers. Factors determining suitable physical condition include blood pressure, visual acuity, peripheral and color vision, depth perception, eye reaction time, night vision, and hearing. Results of the tests indicate that socio-economic status is not significantly related to accident proneness. Psycho-screening can serve to point out the many factors involved in driving and detect deficiencies. —BUS TRANSPORTATION

LIGHT-WEIGHT LATRINE—Fabricated aluminum alloy roofing sheet and V-corrugated sheet (left) are being used by the Southern States Iron Roofing Co. to produce 2 types of easily assembled latrines. Aluminum forms embedded in concrete support aluminum risers and seat (below). —ENGRG. NEWS-RECORD

NEW PRODUCTS

2,000° Insulation—Developed primarily as jet engine cone-and-tail-pipe insulation, the new Refrasil mineral material of H. I. Thompson Co. is said to withstand a sustained 2,000° F. and flash temperatures several hundred degrees higher. —AVIATION

Vapor Degreaser—Vapor from a noninflammable, nonexplosive chlorinated solvent of the Electric Service Repair Co. will rapidly remove oils, resins, pitch and greases from machinery. An electric heating unit vaporizes the solvent (which is recoverable) and the parts to be cleaned are lowered into the 250° F. vapor cloud. Capacity, 500 to 5,000 lb. of metal parts per hr. —ELECTRICAL CONTRACTING

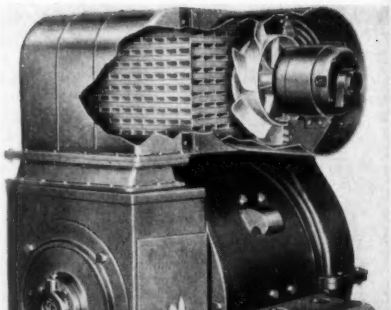
High-speed Diesels—Two new marine diesel engines developing 200 and 275 hp., respectively, at 2,100 rpm. have been introduced by Cummins Engine Co. Piston displacement is 743 cu. in. Dual intake and dual exhaust valves improve performance. The 275-hp. model is supercharged. —POWER

Strip-off Protective Film—Liquid Envelope is a peelable protective plastic film sprayed onto steel and nonferrous sheets prior to cutting and fabricating operations. The 0.002-in. film protects the sheet against scratches, die marks, etc., and against corrosion in storage and shipping. —PRODUCT ENGRG.

Steel-belted Piston—Circling the alloy piston just above the pin bosses, a cast-in, alloy-steel belt controls the piston so that it expands at the same rate as the cast iron cylinder block. Close fitting of the piston is thus possible. Thompson Products, Inc., is the maker. —BUS TRANSPORTATION

Aircraft Soap—A new linseed oil soap of Sherwin-Williams Co. is said not to harm or discolor any fabric-finished airplane, yet to dissolve dirt lodged in covering. —AVIATION

Ultra-precise Jig Borer—Built-in measuring screws and micrometer heads give direct readings to 0.00005 in. in the verniers of large divided drums in the new planer-type jig borer of Societe Genevoise D'Instruments de Physique. Error-compensators in the measuring devices permit a guaranteed accuracy of 0.0002 in. for all settings of the 20½x15-in. work table and of the spindle saddle. Six automatic feeds in either direction and 8 spindle speeds from 75 to 2,000 rpm. are available. —AMERICAN MACHINIST



MOTOR WITH HEAT EXCHANGER—Suited to severe atmospheric conditions, as in cement and coke plants, totally enclosed dc. motors (15 to 200 hp.) announced by General Electric Co. are equipped with unit coolers having 2 sets of air passages. A fan on the armature circulates air through the motor and 1 set of passages. An auxiliary motor and fan blows external cooling air through the other passages. —ELECTRICAL WORLD

Glass Roofing Mat—Employed as a carrying and reinforcing agent for bitumen in roofing applications, a Fiberglas roofing mat produced by Owens-Corning has a nominal thickness of 0.015 in., weighs 0.01 lb. per sq. ft., has a minimum breaking strength of 10-14 lb. per in. width. Bitumen, penetrating the highly porous, heat-resistant mat, provides a waterproof medium. —ENGRG. NEWS-RECORD

Self-correcting Altimeter—To aid air-traffic control radio device of the Square D Co. incorporates a sensitive altimeter instrument which automatically corrects itself for barometric pressure changes as a plane flies within the range of special radio transmitters located at strategic spots. When signals are received from 2 ground stations, an automatic device cuts out the weaker. —AIR TRANSPORT

High-speed Food Package—With walls of paraffin-impregnated fiber, and ends of light-weight metal, a new frozen-food container of American Can Co. eliminates inner-seal bags and outer wraps, and is adapted to high-speed closing machines. —FOOD INDUSTRIES

Salt-water Battery—Developed to power an Army Air Forces radio locator buoy, a battery with a positive electrode of magnesium and a negative electrode of silver chloride on a silver screen is activated when seawater enters a hole in the jacket and serves as the electrolyte. —ELECTRONICS

Rust Inhibitor—Ferrous metal parts are dipped into a 175° F. water solution (2-4% by weight) of Pennsalt RI-50 to prevent rust between machining operations. This product, a white powder, is produced by Pennsylvania Salt Co. —CHEM. ENGRG.

Feed-through Capacitors—Hermetically sealed, metal-cased, feed-through capacitors, designed for attenuation of hf. voltage components, are being produced by Cornell-Dubilier. Unaffected by temperatures as high as 85° C., they have unusually low power factor, are available in capacities from 0.01 to 0.5 mfd. —ELECTRICAL WEST

Fast, Flexible Enamel—Applied by spray, roller-coating or dip, Porciflex enamel bakes in 1 min. at 450° for sheet metal, 15 min. at 275° for other types of work. Its fast drying permits a finishing department to spray continuously. It is well adapted to infrared drying, is said not to crack or flake when struck. H. V. Walker Co. is the manufacturer. —AMERICAN MACHINIST

Folding Boat—Strong enough to accommodate a 5-hp. outboard motor, a plywood boat made by Plyways, Inc., can be folded in less than 2 min. Both sides fold towards bottom, then bottom folds lengthwise. Center-spreader and stern-board insure rigidity afloat. The boats have been tested in 200-mile, rough-water trips. —SCIENCE ILLUSTRATED

Faster Textile Machine—Developed by Warner & Swasey, a new double-head pin-drafting machine may replace the conventional gill box because of its speed and ability to turn out better sliver. Each head uses from 4 to 6 slivers, pulling them through a series of moving fallers, or combs, that travel in the same direction as the slivers. Each head has 74 fallers, each faller carries 145 pins. —TEXTILE WORLD

Gypsum Sheathing—Rigorously tested, a new United States Gypsum Co. fireproof sheathing, with asphalted-gypsum weather-proof core, shows no buckling or warping when used in construction. It has a water absorption of only 3.4% by weight. —ENGRG. NEWS-RECORD

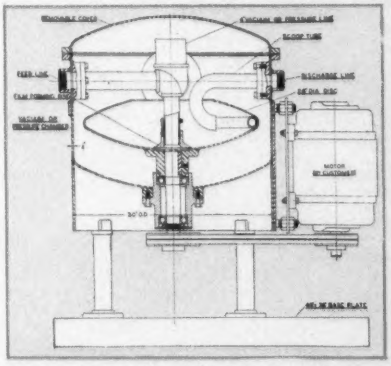
Fabric Hangar—Equipped with a curved, pitched roof designed to withstand high wind stresses and snow loads, the new Ur-Own hangar for light planes consists of steel frame covered with waterproof, flame-resistant, plastic-coated fabric. The wide doors on the BEP Development Co. hangar are of the accordion type. —AVIATION NEWS

Welds Cast Iron—A strong, machinable weld in cast iron is said to be made with the new Ni-Rod electrode of International Nickel Co. It does not under-cut or leave grooves to trap flakes of slag. Preheating usually is unnecessary. —AMERICAN MACHINIST

Room-size Precipitator—By electrostatic ionization, a new 39x26x9-in. precipitator of Raytheon Mfg. Co. removes 90 to 100% of dust in the air of a room. The light-weight collector cell is easily cleaned. It consumes 100 watts. —ELECTRICAL MERCHANDISING

Percentage Timer—R. W. Cramer Co. has designed a timer to open or close an electric circuit for a percentage of a definite length of time. Time percentage control of industrial operation eliminates lag encountered with standard thermostatic devices. —ELECTRONICS

Synthetic Grease—Having lithium as a base, a new grease developed by the Texas Co. matches the performance of the 4 aircraft greases previously required in the range of —100 to 300° F. It has lubricated for 1,000 hr. at 250° F., 10,000 rpm. —AIR TRANSPORT



VERSATILE PROCESSOR—Used for vacuum treatment, homogenizing, emulsifying, dispersing, degassing, evaporating, dehydrating, distilling, and other purposes, this device of Cornell Machine Co. reduces any flowable material to mono-particle thickness without pressure or heat. Fed onto the center spinning disk, the material becomes a thin film by centrifugal force. The turbulence of the film provides an ideal state for vacuum or pressure, heat or cold, diffusional processes or irradiation. Power consumption is 7½ hp. for heavy oil viscosities. —CHEMICAL ENGRG.

NEW PRODUCTS

8-in-1 Tool—Metal disintegration, arc welding, brazing, soldering, drill pulling, air extraction, metal etching, and demagnetizing are all possible with the Thomas Metal Master of Clinton Machine Co. A high-amperage, low-voltage arc is used to disintegrate metal. In arc welding, 100 amp. is provided for 30-min. runs. —AMERICAN MACHINIST

Automatic Boiler Cleaners—Automatic soot blowers on 3 large Niagara Hudson boilers rated at 900,000 lb. per hr. at 1,320 psi. and 900° F. keep the boilers unusually clean, reduce boiler makeup from 1.5% to 0.3%, save 5.7 tons of coal a day, and permit the boilers to operate continuously on automatic control while the soot blowers are in operation. —POWER

Resonance-regulated Generator — Electrical resonance in the circuit holds the voltage constant (± 2%) in the Regulectric a.c. generator developed for engine drive by Electric Machinery Mfg. Co. —ELECTRICAL WORLD

Motor-driven Drawing Board—Full scale lay-out of product designs are possible on the new 6 x 16-ft. drawing board of Landis Tool Co. The board is raised and lowered by a reversing gear motor operated by limit switches actuated by directional pressure of the hand on control rod. —PRODUCT ENGRG.

Improved Fuse—Instant appraisal of rated amperage and operating condition is possible with Eagle Electric Mfg. Co.'s new fuse. Vari-colored disks indicate amperage; a magnifying center sharply outlines the fuse element. Partial disintegration warns of overload, and an "OK" trademark vanishes when fuse blows. —ELECTRICAL CONTRACTING

Electroplated Bearing—An electroplated engine bearing developed by Cleveland Graphite Bronze Co. has high load capacity, good fatigue life. It consists of a steel back, a layer of copper-lead alloy, and a 0.001-in. soft bearing alloy of 3 metals co-deposited by precision electroplating. —BUSINESS WEEK

Safety Rudder Control—Allowing greater ease of control through a power-boost system, and automatic transfer to a spring tab control in case of hydraulic failure, the new rudder control system of the Boeing Stratocruiser retains pilot "feel" without putting undue loads on the flight crew. To overcome customary lag between rudder pedal action and rudder movement, an accumulator is installed in the tail near the boost control valve. —AIR TRANSPORT

Carry-along Flame Cutter—Weighing only 56 lb., an oxyacetylene outfit of National Welding Equipment Co., includes 2 shatterproof oxygen cylinders, an acetylene tank of 10-cu. ft. capacity, regulators, hoses, wrench, and cutting torch in a canvas pack. It can be buckled firmly in a comfortable position across the shoulders. —ENGRG. NEWS-RECORD

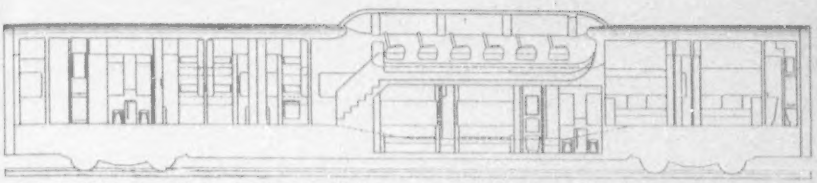
Holeless Hanger—Developed for attaching a cabinet or other appliance to smooth walls without drilling holes, the Kitco device of Kirch-Trumbull Corp. consists of a metal plate with a vacuum cup in the center and plastic disks bolted to the corners. Adhesive is applied to the disks, which are then held against the wall by the vacuum cup. When the adhesive is dry, the plate is removed, the cabinet attached to the bolts in the disks. —BUSINESS WEEK

Electronic Wheel Balancer—With a new Stewart-Warner Corp. instrument, vibrations in a wheel are picked up by a magnetic unit which transmits impulses to a meter that registers degree of unbalance and to a stroboscope which indicates the point of unbalance. —ELECTRICAL WORLD

Enamel Remover—Synthetic enamels are removed cleanly by wrinkling action with Enthone Co.'s new S-300 stripper, with no damage to the base metal. —POWER

Little Pneumatic Wrench—Designed to drive or remove nuts, bolts, and tap screws up to ⅜-in. thread size, a new 3¾-lb. pistol-grip impact wrench of Independent Pneumatic Tool Co. has rotatively striking impact jaws set at a wide radius from the spindle center. A short, rigid spindle shank delivers the blow close to the work. —AMERICAN MACHINIST

FLEXIBLE GEAR TURRET—Power transmitting shafts can be flexibly connected at any angle up to 95 deg. on either side of the zero angle by this device of Brooks Equipment Corp. The larger pair of gears is meshed and drives the smaller pair through a solid shaft; regardless of input and output shaft angles. A hinged housing permits oscillation and rotation simultaneously. —CHEM. ENGRG.



SLEEPER WITH A VIEW—In designing the 2,500 new passenger cars on order, manufacturers are using many new materials and layouts for luxury. This car sleeps 20 persons, seats 24 in a dome built over a depressed section of car. Duplex roomettes, triple-deck sleepers, curtained reclining-seat coaches, cinema cars, and night clubs on wheels also are planned. —SCIENCE ILLUSTRATED

Superior Insecticide—Effective against aphids and mites, hexaethyl tetraphosphate is being manufactured by Monsanto Chemical Co. for use as a spray or dust. Claimed to be superior to nicotine, it will destroy some insects against which ordinary DDT is not effective. —CHEM. ENGRG.

Expendable Pallets—High-strength, lightweight pallets, consisting of a double corrugated-board top supported by wooden blocks, are offered by Techtmann Industries. Top and block ends are dipped into water-resistant adhesive. The low-cost pallets carry a 4,000-lb. load. —TEXTILE WORLD

Precision Profile Grinder—Hardened form tools, profile gages, and sectional dies can be ground to an accuracy of 0.0002 in. with a new Fritz Studer machine. Linear movements of a profile tracer finger are transmitted to the grinding wheel by a pantograph, and swiveling movements are transmitted by link bars which turn the wheel about its cutting edge. —AMERICAN MACHINIST

High-lift Hand Truck—Designed to do the work of a fork-lift or high-lift-truck, the new battery-powered Transtacker of Automatic Transportation Co. is said to be half as heavy, half as expensive. Load capacity is 2,500 to 4,000 lb., lift of platform, 68 in., of forks, 64 in. Buttons on steering handle control forward, reverse, lift power. Vertical movement of handle controls speed and braking. —BUSINESS WEEK

Aluminum Awnings—For industrial plants, aluminum awnings which roll up automatically are offered by Aluminum Awning Co. Baked enamel gives a protective colored coat to the awnings, which do not sag, shrink or stretch. —FOOD INDUSTRIES

New Drafting Instruments—Employing integral embossed buttons to make the lower surface clear the paper by 0.02 in., a 45-deg. plastic triangle of Instrumaster Industries has a 30-60-deg. triangular opening. Plexiglas is used for a 45-deg. hatchliner having an irregular octagonal center piece numbered to indicate spacing. This is manufactured by Dolgorukov Mfg. Co., which also offers a slot-letter having reference lines to aid free-hand lettering.—ENGRG. NEWS-RECORD

4-gun Cathode-ray Tube — Four separate signal indications are displayed simultaneously on the 5-in. screen of a new 18¼-in. cathode-ray tube developed by Electronic Tube Corp. —ELECTRONICS

Coal-pinning Machine—Mounted on crawler tracks, a self-propelled coal- and cap-rock pinning machine, said to eliminate coal-shooter, driller, powder, electric caps, and air compressor, is being manufactured by United Iron Works Co. Pinning weight, with 5-in.-dia. pin, is operated by twin-disk clutches and roller chains and is dropped 9 times a minute. —COAL AGE

Waterproofing Powder—Waterproofing material made from asphalt powder is offered by the Mixtite Corp. Added to oil solvent, the material may be applied as paint, caulking compound, patching cement, or tile adhesive. Enough to cover a barn 40x60x15 ft. costs $7. —SCIENCE ILLUSTRATED

Reclaims Bricks—For cleaning used brick in war-destroyed cities, the Skoda Works at Pilsen is turning out hand-fed machines equipped with 4 bristle-faced, motor-driven cylinders set in pairs horizontally and vertically. —ENGRG. NEWS-RECORD

Vacuum Holds Work in Lathe—Crozier Machine Tool Co. has introduced a lathe with a built-in wet vacuum pump to hold the work without chuck or collet. Piece is released when lathe stops. —AMERICAN MACHINIST

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Prospecting by Plane

The airborne magnetometer, originally used for submarine detection, requires special operating techniques for geophysical prospecting

Before airborne detectors could be used for geophysical surveying, special problems in plane guidance and flight record had to be solved. Areas chosen for survey were covered at definite intervals and altitudes; magnetic data from the magnetometer was correlated with the photographic maps.

Skilled low-level pilots, aided by competent navigators, rapidly learned the technique necessary for the surveys.

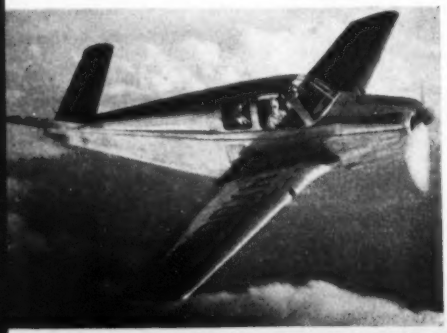
Flight record was made on a split-field camera, later a continuous-strip camera. A mirror brought into the camera an imagine of all the significant settings of the magnetometer control box, plus a serial number which was caused to advance each time the camera advanced. Simultaneously with each picture exposure, an edge mark was made on the magnetometer record, and at intervals the corresponding number was hand-stamped on the record. This number was then entered in the logbook, along with time, traverse, and altitude. The instrument panel was brought into focus in the camera by a single-element lens placed between the mirror and the control box.

The continuous-strip camera was stabilized by a mechanism using mirrors and vertical-seeking gyroscopes. More than 800 miles of flight could be recorded on one roll of film. A second lens and shutter on the side of this camera photographed the serial number on the film.

In surveying over water, Shoran type of position-fixing was used because the patterns obtained made it easy to provide constant traverse intervals over the survey area. With Shoran, the circular paths of distance-measuring devices are equally accurate over the whole area of coverage, and are easy to plot. Shoran's area of poorest fix is along the line between stations, where a fix can probably be made from the land. Continuity of fix was obtained by placing a 1-milliampere recorder in series with the pilot-indicator, a microswitch operating an edge-mark moved by a cam on the 1-mile goniometer of the rate station.

The flight-path of a plane can now be reconstructed at a later date within a space of uncertainty no larger than a 100-ft cube. —ENGRG. & MINING JOURNAL

TRAVEL COST-CUTTER—Beech Aircraft Corp. claims that it is cheaper to transport a $96-a-week employee in its new $7,345 Model 35 Bonanza, with a $400-a-month pilot, than to send him by train, considering the time saved. Three employees can go cheaper than by rail coach, not considering salaries. An air taxi operator can make a profit at 10¢ a mile, plus waiting-time charge. Direct operating cost is 1½¢ per passenger mile, with 3 passengers; cruising speed, 175 mph.; take-off run, 425 ft.; landing, 315 ft.; range, 750 miles. The all-metal plane has a V tail which makes "perfect turns possible without use of rudder." —AVIATION NEWS



HYDRAULIC HOLDING

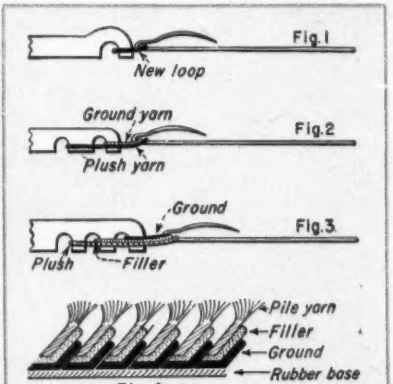
Faster loading, minimum work distortion, preset clamping pressures, and simplified fixture design are among the advantages of hydraulic clamping in machining operations. And the hazards of manual or mechanical clamping are avoided because hydraulic units can be operated from pushbutton or lever-actuated stations.—AMERICAN MACHINIST

FABRICATING VINYL RESIN

In the vinyl resin plant of Bakelite Corp., principal raw materials are several types of vinyl resins, polyvinyl butyral, and copolymer of vinyl chloride and vinyl acetate. In general, resins containing large amounts of the chloride are used in flexible types of product. Plasticizers are: diethylhexyl phthalate, tricresyl phosphate, and triethylene glycol di-2-ethylbutyrate. Heat stabilizers are lead soaps, litharge, and white lead. Lakes and pigments are colorants. The fillers are: finely divided clay, calcium carbonates, and other materials. The principal lubricants are metal soaps and fatty acids.

From the top-floor bins, dry components, fillers, dry lubricants, and some colors are lowered into hoppers, then into 5,000-lb. capacity blenders. A horizontal ribbon agitator is designed to draw the mixed material to the discharge opening. Resins and liquid plasticizers are added to the blender charge, the moistened powder then being carried by lorry to 150-lb. capacity mixers. The mixer fluxes the mass by frictional or applied heat and produces a coherent dough. After further mixing on a hot 2-roll mill, the mass is conveyed to the top of a 4-roll, 3-high calender. Rolls are 66 in. wide and steam-heated. The flexible material is then calendered into tape, thin film, heavy sheeting, or is granulated.

The plant is divided into 16 bays, each leading to a different end product. Air-conditioning circulates 45,000 cfm. through each bay. —CHEMICAL ENGRG.



KNITTING CARPETS—Small, light, circular knitting machines of 4 to 6 needles per in. and 36 in. dia. would produce carpeting 7-8 ft. wide at 18 yd. per hr. according to this proposed scheme. Fig. 1: loop being formed by sinker. Fig. 2: one loop for ground, one for pile surface. Fig. 3: carpet stitch of ground, filler, and plush yarns. Fig. 4: fabric resulting from suggested stitch. One operator could operate 5 machines. —TEXTILE WORLD

GLASS FLOAT—Made of resin-impregnated glass fibers, a molded airplane float developed by Heath Co. has high tensile strength. It is made in sections, and if bottom is damaged accidentally it can be replaced easily with a screwdriver. —AVIATION

OSCILLOGRAPH CHARTS TRUE WELDER PERFORMANCE

Using a cathode-ray oscillograph and associate circuits for reproducing the current and pressure transients of a welding machine on a fluorescent screen, spot-welder performance is accurately analyzed in a Curtiss-Wright plant. This portable, easily operated unit will show the welding current in amperes, the pressure is psi. A timing wave shows the exact relationship of the two. Even welding tip temperature may be indicated. The transients can be photographed for careful study. Previously the true performance of a welder could not be analyzed. —WELDING ENGINEER

AUTOMATIC RECORD SELLING—Each customer, seated at a long "music bar" in Passaic, N. J., pushes a numbered button on a control panel to hear, through earphones, a record chosen from the day's "menu" which is posted above the counter. One control panel does not affect another adjacent to it. Purchase-choices are noted on a pad. —ELECTRICAL MERCHANDISING

REDUCING SEWAGE BACTERIA

In urgent need of reducing the bacterial count in more than 3,000 miles of sewers serving an area of 455 sq. mi., Los Angeles engineers found that Cloroben, a chlorinated hydrocarbon, was effective when introduced into the upper reaches of the system. A minimum dilution of 4 to 1 is important, and the most effective combination for heavy flows was Cloroben in the proportion of 1 ppm. plus chlorine at the rate of 20% of the chlorine demand. Tests indicated a bacterial reduction of 99%.

With Cloroben, putrefaction and the formation of hydrogen sulphide is retarded, and the chemical appears to dissolve or emulsify greases, thus destroying the gelatinous protective sheath around bacteria. A 400-gal.-per-day chlorinated hydrocarbon dosage costs about $700. —ENGRG. NEWS-RECORD

ALUMINUM SUBSTATION STRUCTURE EASES UPKEEP

Sulphur and corrosive gases from factories corrode the galvanized electrical substation structures, necessitating shutdown delay and expense of repeated and hazardous painting. But Pennsylvania Electric Co. has solved this problem by building a structure of 61S-T aluminum alloy with an aluminum-colored waterproof mastic brushed on where members are bolted together. Weighing 35% as much as structural steel, the alloy has a yield strength of 39,000 psi. Factory assembled, the trusses and A-frames were light enough to handle easily, and 8 men erected a 7,500-volt structure in 6 hr., compared to the usual week or 10 days. Other structures of this type will be built. —ELECTRICAL WORLD

3,000% FASTER WELDING

Two rows of holes are drilled along the sides of the movable bed of the giant multiple-spot welder used by Pullman-Standard Car Mfg. Co. to attach stiffeners to the car sides. Light passing through the holes operates a photoelectric mechanism which in turn activates the battery of electrodes. By closing some of the holes with pins, leaving others open, an almost unlimited number of welding combinations can be worked out. Production is 3,000% faster. —BUSINESS WEEK

ENGINEERING WITH GLASS

In installing over 7½ miles of borosilicate glass piping at Oak Ridge, large-scale field fabrication was accomplished for the first time. In fusing more than 30,000 sections of the piping, and in making more than 3,000 intricate fittings, 25 pipefitters became skilled glass artisans. High speed sealing of joints in thick-walled tubing could be accomplished only by combining gas flames and high-frequency current. Electric-resistance furnaces annealed the joints, any strain being detected by a polariscope. —CHEMICAL ENGRG.

Power Plant Progress

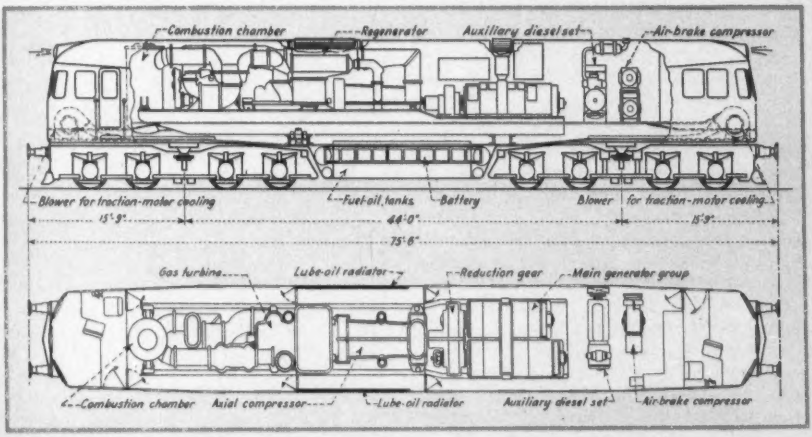
New gas turbines, boilers for wide load variations, and acid cleaning of boilers reported at Detroit ASME meeting

Gas Turbine Developments—Backed by experience with the 2,500-hp. gas turbine locomotive built for Swiss Federal Railways in 1939, Brown Boveri is now testing a 4,000-hp. unit which is markedly superior. Only 3-ft. longer, exclusive of the generators, it uses the same weight of air as the former unit and promises to be considerably more efficient.

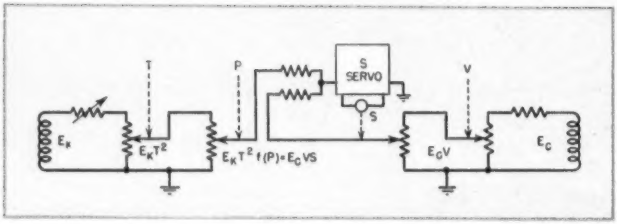
At the Escher Wyss shops, work is under way on a 12,500-kw., closed-cycle plant for stationary service. Guaranteed efficiency is 35% for a 1,200° F. inlet temperature. Full-load maximum pressure is 700 psi.; back pressure, 70 psi. This plant consists of a precooler, 4 compressors, 3 intercoolers, a generator, an oil- or gas-fired heater and 2 turbines with a reheat stage between them. Initial heating and reheating are done in the single air heater, supercharged to about 40 psi. by an exhaust-gas-turbine-driven radial blower. Control and charging compressors are part of a regulating system that changes the density of the air in the working circuit to meet load variations without changing the temperature. Dimensions of the rotating machinery are small, the high-pressure turbine having a maximum diameter of 16 in., the low-pressure, 40 in.

Advanced Boiler Engineering—In designing boilers for wide load variations, as in the Los Angeles Harbor Steam Plant, a first consideration is to make available at once the heat stored in the boiler.

Sudden changes in the steam-output rate, producing momentary disturbance of steam and water flow, require circulatory-system design that insures against stoppage or reversal of flow in any steaming tubes. Abrupt changes in internal sectional area within the circulatory system must be avoided. Geysering, turbulence, and seesawing of the water level are prevented by releasing the



Now under test, this 4,000-hp., Swiss, gas-turbine locomotive uses same weight of air as existing 2,500-hp. unit, is but 3 ft. longer, is expected to be much more efficient.



ELECTRICAL WIZARD—In electrical network calculator, variables are caused to turn shafts of potentiometers. At some point a voltage will be found that is a function of the dependent variable. Circuit is for simple computer that regulates flow of a liquid through a valve. —ELECTRONICS

steam generated in the open space of the main drum. The drum in which steam is released and in which working water level is to be maintained must be unusually large.

In a quick-load-pickup boiler, steam-temperature control is more difficult, requiring superheaters with both radiation and convection surfaces and a quick-acting means of control employing heat exchangers or direct water sprays. Design of setting inclosure and gas and air passages must provide for absorbing shocks resulting from puffs or light furnace explosions.

Fuel-burning equipment must be extremely flexible to meet wide changes in heat-input rates, with no time available for igniting additional burners. Automatic control is an absolute must.

Acid Cleaning of Boilers—Some corrosion occurs when boilers are cleaned with acid, but the rate of attack is not rapid enough to cause concern, and the method is useful and economical for removing encrustations. —POWER

MAGNESIUM PROTECTS STEEL

To prevent electrolytic corrosion of its new Clark electric water heater, McGraw Electric Co. inserts a rod of pure magnesium into the tank. The rod, in combination with the steel in the tank, and in the presence of water, forms a galvanic battery. The current produced causes the magnesium to go into solution and protect the steel. A resistor between the magnesium and the steel limits current flow and retards rate of magnesium consumption. —BUSINESS WEEK

BETTER ARTIFICIAL LEATHER

Improvement in techniques and new types of coatings are giving artificial leather a wider variety of uses. Polyvinyl chloride, polyvinyl butyral, and copolymer vinyl derivatives have been found to give coatings (2 to 14 coats on 35- to 58-in. cotton) with greater resistance to flexing, wear, mildew, water, chemicals, and light. Banks of vertical ovens allow resin coats to be applied in one continuous operation. Cloth is dried by hot coils between each oven. Color is oven-applied and may be baked under infrared.

For automobile interiors, vinyl resins or pyroxylin coatings are used. For trucks, polyvinyl butyral is preferred. Cars to be used in humid areas are equipped with special mildew-resistant coated fabrics. Essential oil introduced during processing masks any chemical odors. —TEXTILE WORLD

HARD ALUMINUM CYLINDERS

The use of aluminum cylinders or liners is said to be practicable as the result of Van Der Horst Corp. of America's new method of plating aluminum with porous chromium. Highly wear-resistant, the plating is full of tiny recesses which hold lubricating oil. —AMERICAN MACHINIST

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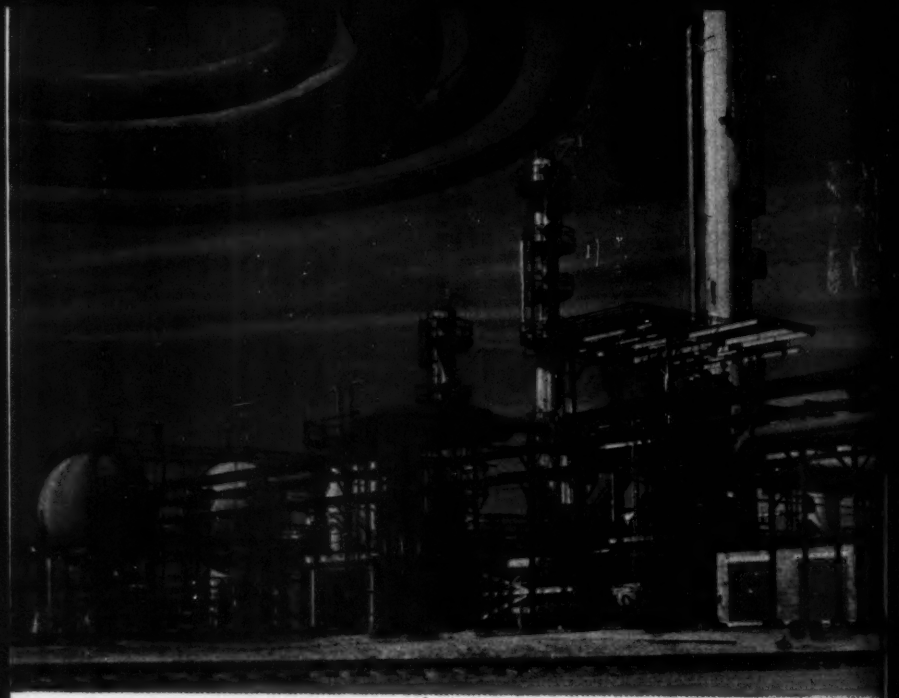

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